Subterranea

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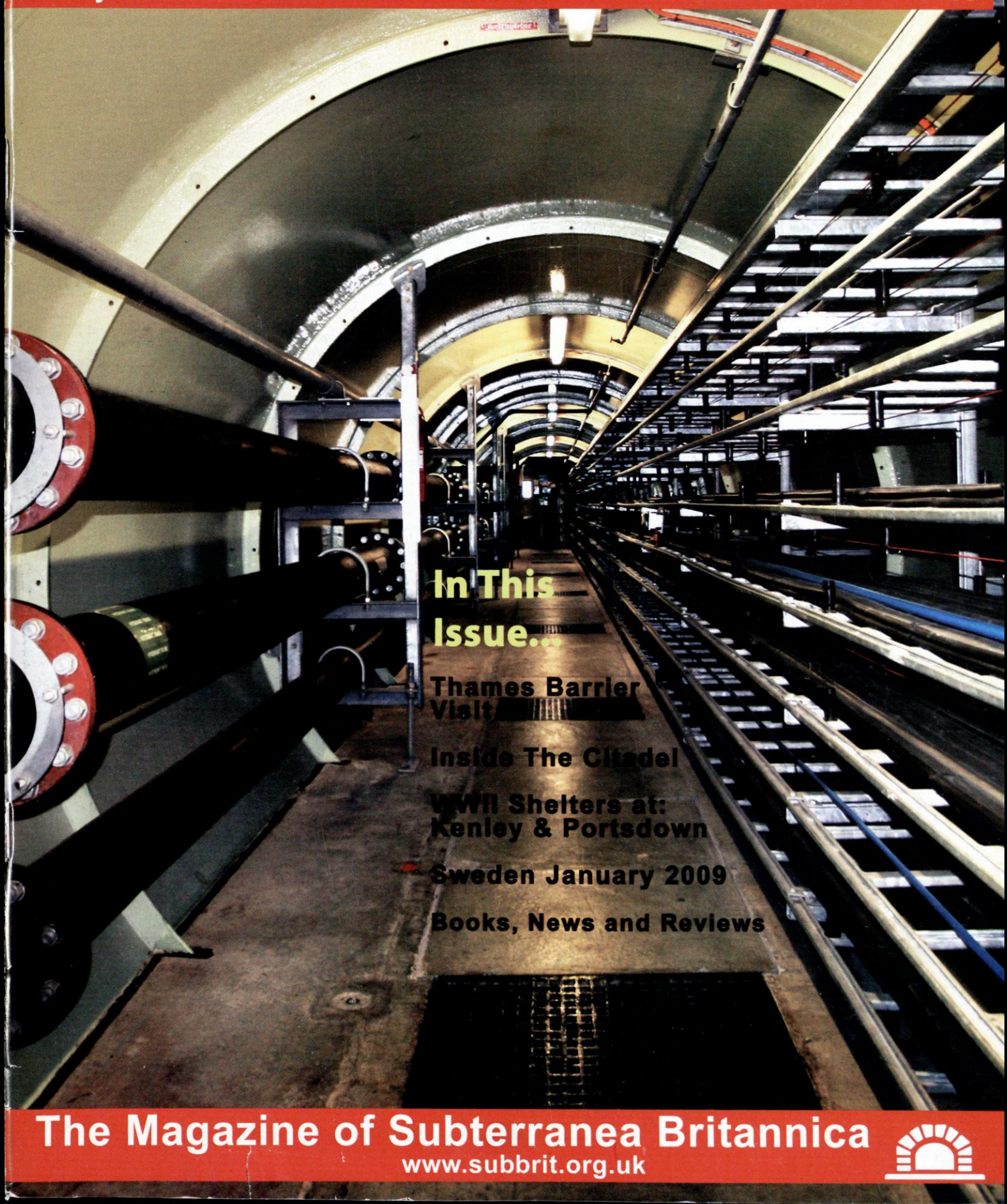

In This Issue...

The Magazine of Subterranea Britannica
www.subbrit.org.uk

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The main focus of interest is on abandoned and forgotten structures and in the case of Cold War structures studies are entirely confined to declassified and decommissioned structures. The society is open to all and its membership includes all walks of life. Members are invited to contribute to this magazine even if this just means sending very welcome snippets from Newspapers and magazines.

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Front cover photo: Typical view from the joint protection trunking into the full length of the tunnel beneath the Thames Barrier.

Back Upper: The main pedestrian entrance into the Mariaberget Civil Defence shelter in Stockholm.

Back Lower: The locomotive shed in Tunnel Quarry, Corsham

All photos by Nick Catford

Newsletters of Subterranea Britannica are published by the committee of Subterranea Britannica. Original articles, book reviews, press cuttings, extracts from books and journals, letters to the editor etc. are welcome. However the editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the editor do not necessarily agree with any views expressed and cannot check the accuracy of any material sent in.

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From the Chairman

Martin Dixon

What a great delight it was to see so many new – as well as old – faces on the January trips to the Thames Barrier. In total 120 attended the visits, over 10% of our current membership. For those who weren't able to attend, Roger Morgan's excellent article in this issue gives full details. We owe our thanks to the Environment Agency for their help and support in arranging the visit. Many organisations now use "Health and Safety", "Insurance", "Terrorism" or other similar reasons to avoid hosting visits to underground sites of interest to us. Full marks to the EA for helping accommodate the flood (pun intended!) of Sub Brit members.

By the time you are reading this edition of *Subterranea*, this year's AGM will have been held and the Committee elected. The Committee meets three or four times a year and oversees Sub Brit and its 'formal' programme of events, publications and affairs . It's important that the committee is in touch with our membership and we're always on the lookout for people who could help steer and develop our Society. The material rewards are non-existent – no second home or secretarial allowances I'm afraid! However, it's a great way to give something back and to help ensure Sub Brit remains a growing and thriving organisation.

If anyone is interested in joining the committee, then please get in touch. We have the ability to "co-opt" members between AGMs; this may be a good way to "dip your toe in the water" if you're not sure this is for you.

Best wishes for a good summer – be it above ground in the sun, or underground somewhere dark, mysterious, wet, or cramped or all of the above!

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events 2009

Sub Brit specific events

27 June 2009 SB Committee meeting

August 2009 "Subterranea" 20 published
** Copy deadline 01 July **

4 - 6 September Sub Brit UK Study Weekend
Kent and around

10 October 2009 SB Committee meeting

17 October 2009 Autumn Day Conference
Royal School of Mines, London

December 2009 "Subterranea" 21 published
** Copy deadline 01 November **

20 March 2010 Hack Green open day for Sub Brit

General events

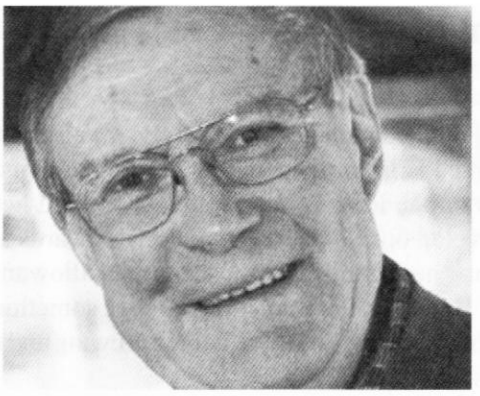
12 - 15 June 8th International Mining Conference, Redruth, Cornwall

19 - 21 June NAMHO (National Association of Mining Historical Organisations) Conference, Matlock, Derbyshire

10 – 13 September 2009 Heritage Open Days across UK

19 – 20 September 2009 London Open House

3-4 October 2009 SFES (French Underground Society) congress in Luxembourg



Ian Walker

It is with deep sadness that we learned of the death of Sub Brit member Ian Walker on 10 April 2009 after a long battle with cancer. Ian had been a member of Sub Brit for over 20 years participating in many of the Society's activities until very recently; a full obituary will appear in the next issue of *Subterranea*.

A memorial service to celebrate his life will probably be held in the Newbury (Berkshire) area on 17 June. Anyone wishing to attend should contact the secretary Roger Starling for further details.

NEWS - ARCHAEOLOGY

NAMHO WORKING ON AN EXTRACTIVE INDUSTRIES RESEARCH FRAMEWORK FOR ENGLISH HERITAGE

The National Association of Mining History Organisations (of which Subterranea Britannica is a member) has been asked by English Heritage to do some work towards a Research Framework for the extractive industries, primarily the mining and quarrying industries. Paul Sowan, our representative on NAMHO, has attended a first Working Group meeting at Matlock Bath, from which a proposal, subject to NAMHO Council approval on 14 March, will be submitted to English Heritage in April. The Working Group convenor is Dr. Peter Claughton, NAMHO's Conservation Officer.

The purpose of the exercise is to identify under-recorded and under-published extractive industries sites, as a guide where (in the event of archaeological evidence being threatened by development) new research has to be considered a priority. Whereas mines for metalliferous ores in general, for example, have been well researched and published, some aspects have been relatively overlooked, such as the stratified Jurassic ironstones of Northamptonshire. Amongst the miscellaneous 'industrial minerals', alum shales (worked on the Yorkshire coast) have received considerable attention in recent years, whereas silica sand extraction by mining or opencast has been relatively neglected and is poorly researched and documented.

A provisional target date of 2011 or 2012 has been set for completion of the Research Framework.

A DEFINITION FOR THE EXTRACTIVE INDUSTRIES

The NAMHO Extractive Industries Research Framework Working Group has been asked by English Heritage to focus primarily on mining and quarrying as commonly understood, more or less defined as the removal of material from the earth's crust, whether underground or opencast, for use elsewhere. Removal of material with the primary intention of producing an open hole or subterranean voids for use for some specific purpose (such as a canal tunnel or a Cold War bunker, for example) lies outside English Heritage's expectations. Likewise, it seems, offshore mineral extraction (much sand and gravel is now commercially won by marine dredging); and extraction of oil, gas, brine, and water from underground or under sea-bed sources. Also extraction of chemicals from sea-water, whether salt by evaporation, or materials such as bromine (commercially produced at Amlwch on the north coast of Anglesey).

However, there is much in common between the technologies of mining for useful minerals, and mining to produce usable holes in the ground. Those employed in tunnelling, under London for railways or electricity cables or sewers for example, are generally known as tunnel-miners. Likewise the drivers of military tunnels, offensive or defensive.

And, much more often than not, those designing open pits or underground voids for some specific transport, storage, defensive, or other purpose, include in their engineering calculations the use of the material excavated. Canal and railway tunnel spoil is essential to form embankments and retaining banks up or down the line, to allow a level course for waterways, or the gentlest economically attainable gradients for railways. In railway development, the ideal is the 'cut and fill balance' – material removed from a cutting or tunnel is ideally exactly equal to that needed for earthworks. Otherwise, surplus has to be tipped at some cost on land not otherwise needed; or in the event of a shortfall material has to be taken, again at some cost, from neighbouring land. In the case of fortifications and bunkers, the excavated soil is a crucial part of the overall engineering plan, as it is required to make a bomb-proof covering or defensive banks. And in motorway construction, there is often a requirement for spoil for the building of bunds to protect adjoining areas from traffic noise.

Another area of overlap is provided by military tunnelling (to blow up an enemy site or structure as in World War I for example); civil engineering mining (such as the removal of Round Down cliff, an obstacle to the South Eastern Railway) near Dover in 1843; or opencast quarrying by tunnel-mining and blasting for slate or limestone as for example at the Minera lime quarries near Wrexham in 1897.

Only rarely is extracted spoil simply not wanted, or a downright nuisance. The Channel Tunnel, of course, produced far too much spoil: it was used to create new land reclaimed from the sea, now a nature reserve called Samphire Hoe. Similarly, there was no use within the project for spoil taken from the London Ring Main water tunnel. Clay from some of London's tube tunnels, however, was used in neighbouring brickworks: clay from the Northern Line went into brick-making at Morden, and from the Victoria Line to Woodside Brickworks at Croydon. And spoil from offensive mining or secret tunnel-driving, all too visible from the air or to satellite photography, had to be disposed of as secretly as possible. Chalk from such works has been sprayed with farmyard slurry to camouflage it, and usually taken away at night for disposal well away from what might otherwise become an all-too-visible prime target for enemy attention. And consider, of course, how all the material dug out from the Kingsway telephone exchange tunnels (extending the Chancery Lane deep shelter southwards) was taken away through the streets without anybody noticing! I have heard it suggested that bakers' vans were used for this sort of operation, on the grounds that these fall into the normal pattern of very early morning traffic!

IDENTIFICATION AND TYPOLOGY OF IRONSTONE EXTRACTION SITES IN THE WEALD OF KENT, SURREY AND SUSSEX

The countryside, on a wide range of rock-types, is littered with shallow depressions (sometimes water-filled), often, and perhaps often erroneously, 'identified' or interpreted as 'bell-pits'. Or, alternatively, as natural solution or subsidence features, deneholes or limestone mines, opencast pits, saw-pits, bombcraters, and so forth. To some extent, the options can be narrowed by a consideration of the geology: solution features can be expected on chalk, for example, but not on clay. Saw pits and bomb craters may be recognisable from shallow heaps of the soil excavated or blown out of them. Life is made no easier by there being more than one sense in which the term 'bell pit' has been used in published work. And it seems clear that in many instances it has been claimed that a shallow depression 'must have' started as a bell pit. This was once the case in the Weald, although there is no record of any claimed Wealden ironstone bell-pit having been dug out and explored. In the few cases where vertical sections have been cut through Wealden ironstone pits, by road-cuttings or modern opencast mineral extraction for example, all have been revealed to be steep-sided open pits, with no undermining from their floors.

Jonathan Prus is currently addressing this question in the Weald, and has published a first checklist of the sorts of evidence that might be sought to resolve the questions for individual sites, and a list of all sorts of origins that may account for shallow depressions in the Weald. Martin Roe has published relevant thoughts and observations on 'bell pits' for coal at Middleton Park, Leeds.

SOURCE: Jonathan PRUS, 2008, Where did all that ore come from? *Newsletter Wealden Iron Research Group* 48, 4 – 5.

ARCHAEOLOGY OF THE COLD WAR AND WORLD WAR II

History is often defined as the study of past human events from written sources, whereas archaeology relies on physical remains for its information. Before surviving written records, only an archaeological approach can tell us anything. After the invention of writing, and even more so of printing, there is a vast and invaluable store of archival and published data.

There are, however, problems with history. Firstly, for an assortment of reasons, no written record was ever made of many events: how many of us keep detailed daily diaries? How completely could you reconstruct your life this day last year? Much, generally 'common knowledge' at the time, is never recorded. But perhaps more seriously, secondly, that which has been written has to be assessed for its reliability. Who wrote it? Why? For what intended reader? A former schoolmaster colleague once told me that in completing class attendance registers he filled in the weekly average attendance for his class as 98.4% for much of his career, and was never questioned about it!

Archival and published sources for the World Wars and for the Cold War do of course survive, but they fail to cover every detail of events in stressful times. Here, archaeological research can help to fill gaps. This is demonstrated by two papers in a recent issue of the Council for British Archaeology's magazine *British Archaeology*, which consider the tangible remains of the German occupation of the Channel Islands, and the women's peace camps at the former Greenham Common base in Berkshire.

SOURCE: Gilly CARR, 2008, Archaeology that matters. *British Archaeology* 104, 18 - 22 [Channel Islands: German occupation in World War II]

SOURCE: John SCHOFIELD, 2008, Peace site: an archaeology of protest at Greenham Common airbase. *British Archaeology* 104, 44 - 49 [Berkshire]

THIRTY MUMMIES FOUND IN A TOMB, EGYPT

The discovery has been reported of 30 mummies in a 2,000-year-old tomb in the area of the vast Saqqara necropolis, 30 km south of Cairo. Eight were found inside coffins (sarcophagi), and the others lined up around the wall at the bottom of an 11-metre-deep shaft.

SOURCE: ANON, 2009, 30 Mummies are found in old tomb. *Metro*, 10 February 2009, page 12.

NEWS - CONSERVATION AND HERITAGE

NO MORE WORLD HERITAGE SITES FOR THE UK?

A Government consultation proposes a moratorium on new World Heritage Sites for the UK on the grounds that WHS designation hinders development. For more information, visit the DCMS website at www.culture.gov.uk/reference_library/consultations/5692.aspx .

Source: ANON, 2009, No more World Heritage Sites. *Current Archaeology* 19(12)(228), page 4.

LOSS OF THE HERITAGE PROTECTION BILL

The Heritage Protection Bill was lost from lack of parliamentary time in Autumn 2008. This would, if enacted, have amongst other things led to an integrated classification of 'heritage' sites and structures, in place of the confusing system of Listed Buildings and Scheduled Ancient Monuments we currently have to contend with. Many 'heritage' structures (including numerous bridges) are concurrently both Listed and Scheduled. You can schedule an underground cavity, but as you cannot 'build' a hole in the ground, you cannot List it! Unless, of course, like many tunnel portals and even linings, there is a 'built' element.

However, it appears that much of what was intended in the Bill can still be implemented without primary legislation. The Government has intimated a wish to progress this, and the Bill may yet reappear.

A prime desideratum, it has been suggested, is that all local government authorities should be urged to establish Local Lists to give some measure of protection to structures not considered to be of the first importance, but to be valued for their historical importance anyway. A number of local authorities, such as the London Borough of Lambeth for example, have yet to establish such Local Lists.

THE BRUNEL MUSEUM TO BE EXTENDED INTO ONE OF THE THAMES TUNNEL SHAFTS, ROTHERHITHE, LONDON

The Brunel Museum, in the Brunels' shaft-top engine-house round the back of Rotherhithe Station (the station currently closed in connection with the integration of the former London Underground 'East London Line' into the main national railway network) commemorates Marc Isambard Brunel [1769 - 1849] and his son Isambard Kingdom Brunel [1806 - 1859] in general, and their work on the Thames Tunnel (made between 1825 and 1843) in particular.

Taking advantage of the temporary closure of the East London Line, and of course of funding being available, the Museum is extending into the top of the adjoining Brunels' working shaft, from the bottom of which the tunnel was bored.

The following details are from a report in the *Newsletter* of the Greater London Industrial Archaeology Society.

The East London Line closed in December 2007 for major engineering works. When the line reopens, as part of the London Overground, it will provide improved transport links to 20 boroughs on fast, frequent, air-conditioned, accessible trains.

TfL [Transport for London] and main works contractor Balfour Beatty-Carillion Joint Venture have also agreed to pay the costs for the design and construction of a floor within the Brunel shaft, as part of the works. This generous gift to the museum will provide, within the Brunel shaft at Rotherhithe, the maximum space available for future expansion of the museum above the operating railway.

A reinforced concrete slab floor is currently being constructed within the 12.6 metre diameter shaft. The slab has been designed to sustain a load of 20 kN / m^2, and spans across the shaft, supported on two tunnel spandrel walls, all of which were assessed for suitability of providing support for the new floor. The slab is 11 metres from the top of the shaft, and 7.5 metres below ground level. Overall the shaft is 19 metres deep from track level to the top of the shaft.

To meet the requirements of the Building Regulations, the space in the shaft above the new floor will be provided with fire separation, and the new floor and associated structural supports provide two hours structural fire resistance.

Following approval of the application by the Trustees of Brunel Museum to the Southwark Council for listed building consent in accordance with the Planning (Listed Building & Conservation Areas) Act 1990, works began in June 2008 and are expected to be finished in November 2008.

The present shaft is completely covered by pre-cast concrete jack arches and riveted support girders, except for a small vent, 3.1 m x 1.25 m, which is covered by a capping slab to protect internal electrical equipment from weather. Personnel access is available from the roof via a car ladder and from a small doorway from ground level. To enable construction of the slab to start, the 7 tonne pre-cast vent capping slab was removed using a 95 tonne Liebherr all-terrain crane, thus providing a small crane access point within the shaft. An elaborate scaffold falsework has been erected from track level to support the soffit formwork, which incorporates an estimated 5,000 metres of scaffold tube. The scaffold design, by Balfour Beatty, allows construction work to continue on the East London Line, including the movement of works trains up and down both rail lines.

At the time of writing, the soffit has been completed, together with the installation of 8.5 tonnes of steel reinforcement. The actual concrete will be poured utilising a 36-metre boom pump, to complete the entire

50m³ (120 tonne) slab in 1 pour. We await final approval to concrete the slab, and as such the site compound has been reduced to a minimum.

Following the curing of the slab, BB-CIV will be removing all redundant steelwork within the shaft above the new floor, which formed part of flood gates installed during the Second World War. A passive stack ventilation system shall be provided from the underside of the new floor to the exterior of the shaft above ground level. The vent capping slab will be replaced and a temporary access tower will be installed down to the floor, ready for the next exciting development.

The shaft sunk by Brunel father and son in 1825, inaccessible since the arrival of the railway in 1869, will soon re-emerge with a new life as a museum above an operating railway.

It has been claimed that this extension will constitute the first subterranean museum to be located above an operating railway. However, your former chairman has drawn GLIAS members' attention to Berliner Unterwelten's WWII air-raid shelter museum at Gesundbrunnen Station in Berlin as having a prior claim. One of the entertaining aspects of the Gesundbrunnen guided tour is a demonstration of the World War II ventilation system. This depends on air pushed upwards through the shelter by trains passing underneath. It is demonstrated by placing inflated balloons in the top of an internal air vent.

HULSE, Robert, 2008, [Brunel museum extension from engine house into shaft at Rotherhithe Station] *Greater London Industrial Archaeology Society Newsletter* 239, 6 - 7.

SOWAN, Paul W., 2008, Underground museums above operating railways. *Greater London Industrial Archaeology Society Newsletter* 239, p6.

HARRIS LEBUS FACTORY WORLD WAR II AIR-RAID SHELTERS, HARINGEY, LONDON

The Harris Lebus factory manufactured furniture and, during both World Wars, war supplies such as ammunition boxes and aeroplane parts. In 1939 a complex of 12 interconnected air-raid shelter tunnels was provided, with an total estimated length of 2.5 kilometres. The facility was made of pre-cast concrete sections, and features cross-passages and ventilation shafts.

The shelters were recorded by archaeological contractors CgMs before destruction and a number of wartime period artefacts recovered.

SOURCE; ENGLISH HERITAGE, 2008, Former air-raid shelters, GLS Depot site, Tottenham Hale. *London Region Archaeology: Greater London Archaeology Advisory Service Annual Review, April 2006 – March 2007*, 10 – 11 (including photograph.)

MAGPIE MINE, DERBYSHIRE

The Peak District Mines Historical Society Ltd (registered charity 504662) has launched an appeal for £120,000 for a mains power supply for its Magpie Mine Field Centre. The Magpie Mine site and mine buildings, near Bakewell, worked lead ore from 1740, and are leased from the Trustees of the Chatsworth Settlement. This is one of the best-preserved lead mine sites in Great Britain, closed as a mine in the 1950s, and Scheduled as an Ancient Monument. It offers simple overnight accommodation for Society members and researchers, and has depended until now on an ageing generator for electrical lighting.

The Magpie Mine Appeal may be contacted, especially with donations, at the Society at Peak District Mining Museum, The Pavilion, South Parade, MATLOCK BATH, Derbyshire DE4 3NR 01629-583834 Email mail@peakmines.co.uk Website http://www.pdmhs.com

KELLY MICACEOUS HAEMATITE MINE, DEVON

The surviving surface buildings and plant of a small mine worked on and off during the years 1797 - 1952 for micaceous haematite (an iron ore) used for the manufacture of mineral pigments have been preserved and made publicly accessible. Preservation work at the mine, near Lustleigh, has been undertaken by the Kelly Mine Preservation Society.

ANON, 2008, Kelly Mine Open Day. *Industrial Archaeology News* 146, page 14

PLANNED RESTORATION OF WHEAL TREWAVAS COPPER MINE ENGINE HOUSES, CORNWALL

The National Trust has acquired a 30-acre cliff-side site at Mounts Bay in the Tregonning and Trewavas District in Cornwall. This includes the two Grade II listed engine-houses, mine-shafts, stacks, flues, and work platforms of the Wheal Trewavas mine, where up to 200 men extracted 17,000 tons of copper ore in the years 1834 – 46. Some minor re-working appears to have taken place (the mine then being known as New Penrose) in 1879. The Trewavas mine worked four lodes, in part below the bed of the sea. It resembles the similarly-protected better-known Botallack and Levant mine sites. The mine site as a whole is Scheduled as an Ancient Monument, and falls within the Cornish Mining World Heritage Site.

Cornwall County Council's Historic Environment Service has completed an archaeological and historical assessment of the site. The two engine-houses (from which the Cornish beam engines have long-since been removed) are in a dangerously derelict condition, and precariously sited on the cliff edge. Their restoration is proposed to be completed by 2009. Enhanced safe public access is envisaged.

The Wheal Trewavas site also includes the building bases of a World War II Chain Home Low radar station.

Half a mile to the north, the National Trust has already (in 1970) preserved the engine-house of the Wheal

Prosper mine at Rinsey. This worked tin from an inland extension of the same four lodes in the 1860s.

SOURCE: Graham THORNE, 2008, A cliff top Cornish mine saved by the National Trust. *Industrial Archaeology News* 146, pages 1 and 8 – 9

SUSSEX INDUSTRIAL ARCHAEOLOGY SOCIETY REPORTS

Ron Martin, arguably the UK's premier recorder of industrial archaeology sites and structures, is noted especially for his superbly detailed and executed measured drawings. He is Secretary to the Sussex Industrial Archaeology Society, which body will supply at moderate cost (covering photocopying and postage) the following site reports of underground interest:

MARTIN, R.G., and Clem GILL, 2005, *Hastings West Hill Cliff Railway engine room report*. Sussex Industrial Archaeology Society: 8pp + 4 A3 sheets of drawings [The still-operational funicular railway and engine room are partly underground]

MARTIN, R.G., 2005, *Report on Royal Observer Corps 2 Group Headquarters and UKMO Metropolitan Sector Control, Denne Road, Horsham, West Sussex. NGR TQ 1740 3024*. Sussex Industrial Archaeology Society: 8pp + 4 A3 sheets of drawings.

Enquiries and orders should be sent to R.G. Martin, Sussex IA Society, 42 Falmer Avenue, Saltdean, BRIGHTON, East Sussex BN2 8FG (T) 01273-271330.

BRITISH COAL COLLECTION

This volume is a catalogue of artefacts, printed and manuscript documents, printed ephemera, photographs, and works of art relating to the British coal-mining industry from nationalisation in 1947 to privatisation in 1995. An introduction describes the means by which materials were collected by the National Coal Board and its successor the British Coal Corporation, and at first housed at Lound Hall in Nottinghamshire, and later at museums established on major coalfields such as Big Pit (Wales), Lady Victoria (South Wales), Beamish (Durham), Caphouse (Wakefield), Chatterley Whitfield (Staffordshire), Salford (Lancashire) and Woodhorn (Northumberland.) Several of these have subsequently been closed (as has Lound Hall), but much of the surviving English material is now at the National Coal Mining Museum at Caphouse Colliery, Overton, some five miles west of Wakefield.

The objects catalogued comprise almost anything, however large or small, that has been made or used in connection with coal-mining. Some examples selected at random include accident books, badges, black powder tins, candles, coal-cutting machines, detonator keys, electrical and mechanical equipment, lamps, railway track and rolling-stock, surveying instruments, tools, weights, and weighing scales. There is a colliery index in pages 189 – 195.

DETAILS: Gareth SALWAY, 1999, *The British Coal Collection*. Overton: National Coal Mining Museum for England Publication 2: viii + 210pp + 47 plates [ISBN 1-872925-05-7] [Available from National Coal Mining Museum for England, Caphouse Colliery, New Road, Overton, WAKEFIELD, West Yorkshire WF4 4RH website www.ncm.org.uk]

NEWS - DEFENCE AND MILITARY

WW1 TRAINING TUNNELS DISCOVERED AT SHORNECLIFFE, KENT

A unique system of trenches which has remained undiscovered for almost a century has been found by a team of archaeologists and historians in a wood behind a current army camp at Shornecliffe in Kent. The overgrown remains of the dug-outs were used to train soldiers during WW1. They include a zig-zagging network of tunnels, bunkers and shelters.

Some of the trenches still have the original corrugated iron used to prop up the sides. It is hoped to clear the site of undergrowth to create a visitor attraction.

SOURCE: *Your Shepway* 1 April 2009

YORK COLD WAR EXPERIMENT

Holed up in York and armed with minimal supplies, they listened to the end of the world as they knew it. The three women, locked in a makeshift nuclear bunker, suffered hallucinations, despair and boredom as they sat in the darkness with only a radio for communication.

It was one of the most remarkable experiments ever undertaken in York, as the city put its cold war defences to the test. Now, more than four decades on, historians want to trace those who took part.

City of York Council's archives team has launched an appeal for stories from people involved in two civil defence experiments in the mid-1960s, when the threat of nuclear war loomed large and cities across the land were preparing for the worst.

In 1964, the Home Office issued a handbook called *Advising The Householder On Protection Against Nuclear Attack*. It told people how to build shelters, and what sort of food to store, among other things.

The Civil Defence Committee in York devised two experiments to test the guidelines, including one in March 1965 in which a simulated fall-out shelter was constructed in the Guildhall. Three volunteers – Margaret Jones, Winifred Smith and Mildred Veale – entered the shelter for 48 hours, with no electricity, little food, and a radio set that played seven pre-recorded emergency messages.

Anyone with information should phone the archives team on 01904 551878.

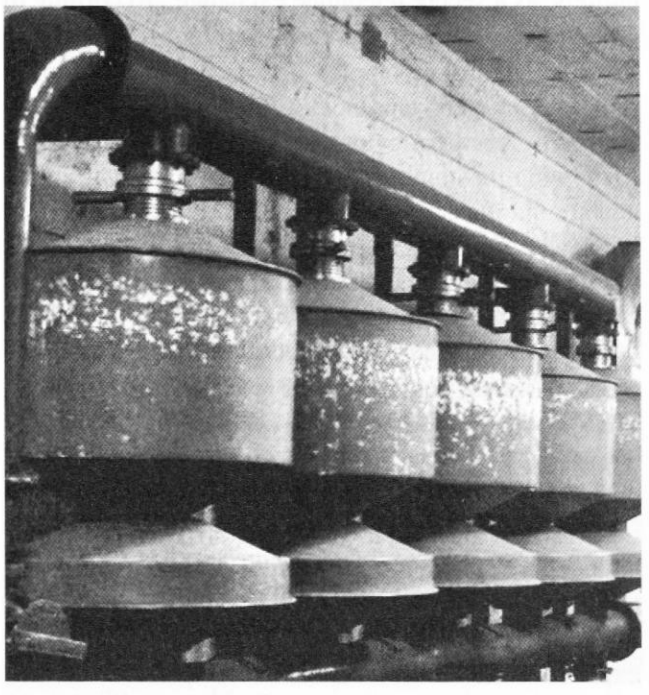
SOURCE: *The Press* (York) 31 March 2009

PROPOSAL TO PROTECT DRAKELOW TUNNELS

Wyre Forest District Council are proposing statutory protection for a set of tunnels originally excavated during World War II, between 1941 and 1943, for Rover, to act as 'shadow' factory for aeroplane engines. Later uses included a Regional Seat of Government during the Cold War, and subsequently a Sub-Regional Headquarters, and finally a Regional Government Headquarters. Four tunnels give access to about four miles of interconnecting tunnels.

Above the tunnels on the hillside are two large sets of cave-houses, many of which are pre-Enclosure in date and the remnants of the 'Swiss Village', a mid-C19 philanthropic example of housing, unfortunately much of which has been demolished. All tunnels, caves and remnants of the Swiss Village are included.

SOURCE: Wyre Forest District Council meeting agenda.



Gas filters in Mussolini's bunker

MUSSOLINI'S BUNKER TO BE TURNED INTO ART GALLERY

Benito Mussolini's 475-square-metre World War II Bunker in the E.U.R. district of Rome is to be transformed into an Art Gallery where contemporary artists will show their work.

Il Duce also built bunkers under his private residence, in 'Villa Torlonia' and under his office at 'Venice Palace', two of the largest underground enclosures in Rome, apart from the bunker at E.U.R.

The E.U.R. bunker is described as an oppressive space with large and narrow chambers divided by cement pillars and separated from the exterior by a wall 20 centimetres thick and a void measuring 1.25 metres between the exterior and the bunker.

Situated under the 'Palazzo degli Uffici' the bunker was built by Il Duce as the site for Rome's World Fair in 1942 (which never happened because of the war); the construction of the bunker was authorised by Mussolini himself to protect employees and high-ranking officials that worked in the building.

Today's visitors go inside through a staircase situated on the side of the building which leads to an armoured and gas-proof door. The bunker could hold up to 300 people. Numerous artefacts still remain including two stationary bicycles that would feed a dynamo that gave emergency power to the whole complex and to the ventilation system in the event of a mains power failure.

SOURCE: *Art Daily* March 2009

AMMUNITION STORES IN HYDE PARK AND KENSINGTON GARDENS FOR SALE, LONDON

A Grade II Listed ammunition store in Kensington Gardens, built in 1805, is offered for sale by the Royal Parks, as is a similar structure known as the Nursery (its latest use) in Hyde Park. Suggested uses include an art gallery, education centre, exhibition venue, garden centre or gymnasium.

SOURCE: Mira BAR-HILLEL, 2008, Royal Parks invite bids for historic ammunition store. *Evening Standard*, 24 September 2008, page 20.

DEFENCE ROLES OF THE 'CAVES' AT REIGATE, SURREY

Reigate town centre has numerous artificial 'caves' excavated in the Folkestone Sand, from do-it-yourself cellars to quite extensive pillar-and-stall mines worked primarily for glass-sand, and having several subsequent uses, especially during World War I and World War II. There is also a small tunnelled work in a chalk pit overlooking Reigate Hill, made during World War II. And a number of now-sealed hearthstone mines and underground quarries along the foot of the North Downs.

Local folklore has it that that Field Marshal Bernard Law Montgomery of Alamein [1887 – 1976] had at one time an underground headquarters in either the chalk tunnels or the sand 'caves.' John Wilkins, a retired engineer who worked for Reigate Borough Council during World War II, has shed some light on this question. He and a colleague, Gilbert John Hoad, made a 'full survey' of the Tunnel Road 'caves.'

The West 'caves,' he reports, were converted for use as a public air-raid shelter, a timber emergency escape staircase being installed in the northeast corner. The supporting brickwork and hand-rails of this can still be seen underground, although the timber has not survived. This led to a doorway (now bricked-up) in Tunnel Road, just north of the road tunnel's northern portal. He adds that the underground rifle range here (still operated today, now by the Reigate Miniature Rifle and Pistol Club) was provided by the Borough Council in 1897 to celebrate

Queen Victoria's diamond jubilee. It was used by the Local Defence Volunteers of the day, fore-runners in name of the WWII Local Defence Volunteers (later Home Guard).

The East 'caves' were modified to form an alternative Air Raid Precautions / Civil Defence control centre, for use in the event of the main centre in the strengthened basement at the nearby Town Hall becoming inoperable. As it appears that the Town Hall suffered no major damage during the war, it seems likely that little if any use was made of the underground facility.

John Wilkins' account continues with some details of Montgomery's several headquarters locations in southern England, including Lancing College and, from December 1941 (when he was South-Eastern Commander) at 'The Rock' preparatory school 'just above the Yew Tree Inn' on Reigate Hill. Mr. Wilkins designed a retaining wall to enable a local contractor (George Faulkner & Son) to widen the approach road to The Rock to allow access by large Army vehicles. Montgomery left Reigate on 10 August 1942 to take command of the 8 Army in Egypt. On his return to England he set up a headquarters at St. Paul's School in London, and later at Southwick House near Portsmouth preliminary to the Normandy landings. Our informant says that so far as he was aware, Montgomery had nothing to do with the Borough's sand 'caves'. And he says nothing about the tunnel system in the chalk close to The Rock. When the author of this abstract (Paul Sowan) visited the then-accessible chalk tunnels some years ago, he had the impression that they hadn't actually been completed: there was, for example, no sign of lavatories within the small tunnel network.

WILKINS, John, 2009, 'Caves weren't planned for wartime phone exchange.' *Surrey Mirror*, 15 January 2009.

REAL ALE BREWERY PLAN FOR SPITBANK FORT, PORTSMOUTH, HAMPSHIRE

Plans are being submitted to Portsmouth City Council for a real ale brewery at Spitbank Fort, described in a local paper as 'one of the smallest of ... Palmerston's Follies.' The fort currently houses a museum which attracts 7,000 persons per annum. The brewery plans depend on water from the fort's own well, and include a mineral water bottling plant, a recording studio, a helicopter landing pad, and three sets of dormitories, and a classroom (most of which hardly seem to relate to brewing!). Another part would be converted into an eight-bedroom house. It is intended that the museum should continue, alongside all this.

SOURCE: ANON, 2009, Beer barrels replacing gun barrels at fort. *Isle of Wight County Press*, 13 February 2009, page 14.

CHANCERY LANE DEEP AIR-RAID SHELTER / KINGSWAY TELEPHONE EXCHANGE UP FOR SALE, LONDON

It has just been announced that the more-or-less-secret network of tunnels under High Holborn, Chancery Lane tube station (Central Line) and land to the south is to be offered for sale by British Telecom. Subterranea Britannica visited this interesting complex during the London Study Weekend, 1995. It reputedly has connections to the 'top secret' tunnels to Whitehall and elsewhere (securely gated off during our visit.)

This started as one of the World War II deep public air-raid shelters, with two 'station size' tunnels below the Central Line platforms at Chancery Lane, from which there was an entrance. The shelter was designed and built to accommodate 8,000 people. After the War, during the Cold War, additional tunnels were driven to the south, the use of which appears to have been largely, if not entirely, as a secure telephone exchange. According to *The Guardian*, it has also been used by MI6.

As completed, the complex had access by lift from a rather anonymous entrance on the north side of High Holborn. A rather obvious ventilation shaft and goods lift serving the complex can be seen in Furnival Street, and around the corner in Took's Court there is a further windowless building with provision for ventilation and, it would seem, an emergency exit. One wonders what attractions an emergency exit may have for the inhabitants of a 'nuclear bunker' during thermonuclear war!

SOURCE: BBC Radio News 13.00, 15 October 2008 / *The Guardian*, 16 October 2008, page 10.

THE BIG BANG AT HELIGOLAND, GERMANY

On 18 April 1947 the Royal Navy detonated 6,800 tons of 'unstable ordnance' at the small German island Heligoland (German Helgoland). This has been claimed to be the 'largest man-made, non-nuclear detonation in history.' That claim may well be true for a *deliberate* explosion. However, the accidental explosion of a vast quantity of munitions stored in a gypsum mine near Fauld, Staffordshire, on 27 November 1944 may also be in the running. In that event, an entire farm and its occupants disappeared, and an enormous crater still remains today.

The red sandstone cliffs of the 1.6 km x 1.3km island, Germany's 'unsinkable battleship', were tunnelled for military purposes in World War II. The 1947 detonation solved two problems – disposal of surplus ammunition, and destruction of the military infrastructure.

The explosion had an interesting third benefit. Seismological observatories throughout Europe recorded the shock, and analysis of the mass of data captured allowed important conclusions to be reached concerning the sub-crustal structure of the earth.

For further information on Heligoland, now essentially a day-trippers' destination for tourists at Cuxhaven, see

Subterranea 13 (2007), page 63. The island off the North Sea German coast, smaller than Hyde Park, is almost equidistant (32 km.) from and protects the mouths of the Weser, Jade, Elbe, and Eider rivers and the Kiel canal.

SOURCE: Péter VARGA, 2008, The Heligoland explosion. *Geology Today* 24(5), 169 – 170.

RAF HOLMPTON

A third edition of a souvenir guide book to the publicly accessible RAF Holmpton Bunker near Withernsea, East Yorkshire (visited by Subterranea Britannica during the September 2008 Study Weekend) has been published. The A5 booklet contains historical details and photographs, a location map. and floor plans etc.

The two-floor subterranean bunker is at Holmpton, about three miles down the coast from Withernsea. Information is available from 01964-630208

Email info@rafholmpton.com

website www.rafholmpton.com.

The booklet is priced at £ 3.75 (postage extra.)

RAF HOLMPTON, 2007, *Royal Air Force Holmpton: a brief history. 3rd edition*. Holmpton: Holmpton Initiative Project Planning Office: 36pp.

NEWS – MINES AND QUARRIES

MEDIEVAL DENEHOLE AT NORTHFLEET, KENT

Members of the Kent Underground Research Group have responded to a request to investigate a denehole at TQ 6191 7304 at a housing development site on the west side of Springhead Road, Northfleet. This is the third denehole found at this site. The shaft, as is often the case, was sunk through Thanet Sand, and the six chambers excavated in the underlying chalk. Rod Le Gear's report, accompanied by a plan and section, suggests a twelfth century date.

SOURCE: LE GEAR, Rodney F., 2009, Medieval denehole at Northfleet. *Newsletter Kent Archaeological Society* 79, page 16.

GOOD NEWS FOR MEADOWBANK ROCKSALT MINE, WINSFORD, CHESHIRE

The UK has three mines producing rocksalt, most of the output of which is applied to road-treatment in icy weather. Salt destined for use as a feedstock for chemical industry is almost exclusively won as brine, extracted by solution mining in and around Cheshire. Rocksalt is mined at Carrickfergus (Northern Ireland), Meadowbank mine at Winsford (Cheshire) and Boulby (East Yorkshire), although Boulby mine is primarily a potash producer.

The British Isles experienced a lengthy spell of cold weather in early February 2009, with the heaviest snow (at least in the London area) for 18 years.

This snowfall, perhaps, did not much impress those of use who recall the snow of January to March 1947!

Winsford mine, on the outskirts of the town, was reported recently to be producing 300,000 tonnes per week. It has reserves, unmined, estimated to be sufficient to last for 70 years.

SOURCE: MORRIS, Steven, and Helen PIDD, 2009, Services at breaking point as freeze continues. Councils run low on salt to treat roads. *The Guardian*, 6 February 2009, page 4.

BETTESHANGER COLLIERY SITE, KENT

Foulmead Country Park, near Deal, opened to the public in May 2007. It comprises the site and spoil tips of the former Betteshanger Colliery, the last of the four major Kent Coalfield mines to open (in 1924) and the last of them to close (in 1989). An interesting feature is the preserved spoil tips. These have now been declared a RIGS (Regionally Important Geological Site) as the waste shale in them is fossiliferous, and much resorted-to by palaeontologists, amateur or otherwise. The mine is remembered fondly by your former chairman, Paul Sowan, as it was the first working mine he visited.

SOURCE: ANDERSON, Ralph, 2009, How Betteshanger colliery became a RIGS. *Newsl. Kent Geologists' Group* 17, 11 – 13.

GARDEN COLLAPSES INTO 170-FOOT MINE SHAFT, HUDDERSFIELD, YORKSHIRE

What is thought to be an abandoned late 19 century coal-winding shaft has opened up yards from the back door of an Edwardian cottage in Huddersfield.

SOURCE: ANON, 2008, Garden collapses into 170 ft mine shaft. *Daily Telegraph*, 22 December 2008.

RESTORATION OF COLLIERY ENGINE-HOUSE PUT ON HOLD, CAERPHILLY, GWENT, SOUTH WALES

The Bryngwyn colliery engine-house (a Scheduled Ancient Monument) at Bedwas, Caerphilly, is the last remaining 'inverted Cornish engine-house' in Wales, and was described in some detail in by the late David E. Bick (Bryngwyn Colliery, Bedwas, Gwent) in *Archive* 38 (2003), pages 34 – 42).

Proposals to obtain consent to demolish the building and redevelop the site having been successfully resisted, an agreement was reached with the land-owners and developers, Charles Church, Caerphilly County Borough Council and CADW to the effect that Charles Church would repair the structure with CADW funding, and that it would then pass into the ownership of the Borough Council. The developers have now put this scheme on hold, although restoration is said now to be scheduled for May or June 2009.

SOURCE: Graham Levins, 2008, Bryngwyn engine house. *Descent* 203, page 27.

CWMYSTWYTH MINES, WALES

The metalliferous mines at Cwmystwyth, North Wales, have been sealed since 2006. Discussions between the Ceredigion Mines Group, the Welsh Mines Preservation Trust and the Crown Estate's mineral agents have evidently ground to a halt, with the Crown Estate unwilling to negotiate access underground. However, and offer has been made to sell the mines, and the mineral and grazing rights, to the Trust for £1.

The Trust has felt unable to accept this offer, as meeting the costs of work needed to make the site safe and covering insurance, would prejudice its work at other sites. Attention is currently being given to the establishment, with other interested parties, of an independent Trust and company limited by guarantee to assume ownership. In the mean time it is requested, in the interests of moving negotiations forward, that no visits should be made to this site. Further information may be had from the Secretary of the Welsh Mines Preservation Trust, Graham Levins, at Secretary@welshmines.org .

SOURCE: Levins, Graham 2008 The latest at Cwymstwyth. *Descent* 203, page 27 [Wales: metalliferous mines]

MINING INFORMATION WEB PORTAL LAUNCH

Mines have been operated underground in Great Britain for around 5,000 years, extracting 'everything from' (as they say) flint to uranium ore. Plans, sections, and data for shafts have been comprehensively indexed in one and the same database, by and large, only for coal mines.

A web portal for all kinds of mine plans has been put together by the British Geological Survey, the Coal Authority, the Health & Safety Executive, the National Archives, and the Valuation Office. In the first phase of this project, an index of as many non-coal mine plans as possible has been made, and members of the Mining Information Group are working on scanning plans to make them available via the web. Accessible information is to include mine names (a difficult area as many working mines had more than one name, and the exact identity of many mines named in documents is often not explicitly stated), locations, materials worked, abandonment dates, and the whereabouts and accessibility of plans.

The portal, in its current state, is at
http://www.bgs.ac/nocomico/
Email address nkay@bgs.ac.uk .

SOURCE: British Geological Survey press release, 20 November 2008.

TWELVE DIE IN EXPLOSION IN PHOSPHATE MINE NEAR MURMANSK, RUSSIA

An explosion (presumably of a methane / air mixture) has occurred in a mine in northwest Russia, in the Murmansk region, operated by a firm called Apatit, part of the PhosAgro fertiliser group. Presumably, therefore, the material mined is the mineral apatite. Chemically, apatite is a mineral form of calcium phosphate, which is also a principal component of human bone. This incident, in which at least 12 persons reportedly died, reminds us that methane is not restricted to coal-mines. Closer to home, there was a fatal accident in which methane / air exploded in the gypsum mine in East Sussex.

SOURCE: ANON, 2008, At least 12 people die in explosion at mine. *The Guardian*, 13 December 2008, page 3

ACID-LEACHED SAND FROM ALDERLEY EDGE COPPER MINES (CHESHIRE) IMPLICATED IN PRESTON BYPASS AND MANCHESTER AIRPORT FIASCOS, LANCASHIRE

The 50th anniversary of the opening of Britain's first motorway was celebrated (in the eyes of those who feel motorways to be a worthy cause for celebration) in December 2008. Harold Macmillan, the Prime Minister of the day, opened the 13.2 km (8.26 miles) Preston Bypass on 5 December 1958. Forty-seven days later the road was closed on account of a dangerously deteriorated surface. At the time, this scandalous outcome of £4m worth of public expenditure (at 1958 prices) was put down to hard severe frost followed by a rapid thaw in the weeks before the opening.

The Preston Bypass is now the section of the M6 between junction 29 and the M55 junction east of Preston.

This unfortunate event has now been linked with a similar failure of a new runway at Manchester Airport. The common factor is the use as aggregate of waste sand from the former copper mines at Alderley Edge, Cheshire.

These ancient mines, worked intensively from 1860, extracted sandstone impregnated with copper ore (primarily the carbonates malachite and azurite) with traces also of lead and cobalt compounds. The copper was extracted by leaching the ore with hydrochloric acid, the metal being precipitated from the resulting copper chloride solution by using scrap iron to displace it. The left-over leached sand was deposited as what came to be known locally as the 'Sandhills', note, for the failure of vegetation to grow on them.

Subsequently, contractors purchased the sand for filling sandbags and for aggregate for the Bypass and for the runway at Manchester. The sandbags rapidly rotten, as a result of the acid, and the motorway and runway surface deteriorated, it has been suggested, from the same cause.

SOURCE: ANON, 2009, Was acidic soil to blame for motorway scandal? *Current Archaeology,* 19(12)(228), page 8.

NEWS – MISCELLANEOUS

PEAK DISTRICT MINES HISTORICAL SOCIETY – 50TH ANNIVERSARY 1959 – 2009

The Peak District Mines Historical Society (PDMHS) is a registered charity, founded in 1959, and incorporated as a company limited by guarantee in 1975.

It is based at the Peak District Mining Museum, which it operates, in the Pavilion at Matlock Bath. The Museum includes an underground visit in a small mine working almost immediately opposite, in Temple Road on the other side of the A6. The Society also has a field centre at the substantial surface remains of Magpie Mine, and has small open-air displays at other locations.

The Society's *Bulletin*, now titled *Mining History*, is an impressively presented journal dealing with a wide range of mining history and archaeology topics, although historically the Society has been especially concerned with the mining of lead, fluorspar, 'marble', and other minerals in and around Derbyshire. There is also a regular *Newsletter*, circulated to members.

The Peak District Mines Historical Society is just a year older than one of the United Kingdom's other principal mining history societies, the Northern Mine Research Society, founded in 1960, which body (more or less based in Yorkshire) publishes Britain's other comparable journal, *British Mining*.

PDMHS is hosting the 2009 mining history conference at Matlock Bath, over the weekend 13 / 14 June. For further information, visit http://ww.pdmhs.com or (for the Museum) http: //www.peakmines.co.uk.

UNDERGROUND CHAMBERS DISCOVERED IN PRINCES STREET, EDINBURGH

Tram workers have discovered three mysterious underground chambers on Princes Street, Edinburgh which could date as far back as the 18th century.

The discovery of the dome-shaped chambers was made close to the bus stop next to 'The Mound', opposite 'Clinton Cards'.

Workers for Carillion - the company responsible for rerouting utilities as part of Edinburgh's trams project - were attempting to relocate an underground water pipe when they came across the chambers, which consist of brick and stone and are said to be in excellent condition. The chambers are in a row and appear to have doorways facing Princes Street Gardens but these have been blocked with rubble. The chambers are approximately 3 metres wide and 2.5 metres long and are located around one metre underground. The back and front walls of the chambers are made of stone with brick arches on top.

It is not yet known what the chambers were used for but it is thought they were created around the time that the Edinburgh's 'New Town' was built.

The find will be documented and covered over, with Edinburgh City Council keen to stress that the tram works will not be delayed by the discovery.

SOURCE: *Scotsman* 16 March 2009

NEWCOMEN SOCIETY TRANSACTIONS RELAUNCHED WITH A NEW TITLE

The *Transactions of the Newcomen Society*, an academically respected journal devoted to the history of engineering and technology, is to be relaunched as the *International Journal for the History of Engineering and Technology*. The Society was established in 1920, and was named after Thomas Newcomen [1663 – 1729] who had, by 1698, invented as atmospheric steam engine which, from 1712, was used to pump water from mines. Papers in the *Transactions* in recent years have been on a very wide range of topics besides mechanical engineering, including the civil, electrical, and electronic branches of engineering.

BUNKER HOTEL (ZERO STARS) IN SWITZERLAND

The Null Stern (zero stars) Hotel, a refurbished Cold War bunker, has opened at Sevelen in Switzerland. It has no heating installed, but guests are offered hot-water bottles and carpet slippers. Ear-plugs are also issued, to blank out the sound of the ventilation system. A further drawback is that, in the event of a nuclear war the shelter has to be handed back to the authorities within 24 hours. However, the cost of an overnight stay is of the order of £6 for dormitory space, or £17 for a 'luxury room.' (Frank and Patrik Riklin, the proprietors, have found the venture to be so popular that the establishment now operates year-round. It has been suggested than many of the other nuclear bunkers in Switzerland could be similarly used.

Sevelen is in eastern Switzerland, on the main railway line from Zurich to Innsbruck (Austria), between Buchs and Sargans, and more or less facing Vaduz (Liechtenstein) across the valley.

SOURCE: ANON, 2008, Fancy a hotel stay for £6? There's just one catch – it's a nuclear bunker. A room with no view. *[London] Metro*, 5 December 2008, page 3.

COUNTY COUNCIL EXPRESSES AN INTEREST IN HOSTING A NUCLEAR WASTE REPOSITORY, CUMBRIA

The Labour leadership team at Cumbria County Council has expressed an interest in the Government's offer to local authorities of investment in 'roads, school, and other public services' in return for their agreeing to host nuclear waste disposal facilities. The Government is said to be 'unlikely to take a final decision on a high-level waste repository until 2025'. The viability of a new generation of nuclear power stations, it has been suggested, would depend on a deep underground repository for storage of the radioactive waste generated.

SOURCE: Terry MACALISTER, 2008, Council leaders offer Lake District as nuclear dump. *The Guardian*, 10 December 2008, page 27.

UNDERGROUND NUCLEAR POWER STATIONS SUGGESTED

A letter in the *New Civil Engineer* suggests that any new nuclear power stations should be build underground, as of course many hydro-electric stations already are. Doug Brown points out that containment of radioactive release from the Chernobyl disaster in Ukraine, and the subsequent entombment of the reactor, would both have been greatly facilitated had the station been in a rock-cut cavern from the outset.

SOURCE: Doug BROWN, 2008, Bury nuclear power stations. *New Civil Engineer*, 11 September 2008, page 19.

BRITISH CAVER 1 (1936) – 129 (2007) CEASES PUBLICATION

The *British Caver* was launched by Gerard Platten [1899 – 1970] in 1936, the first five issues having the title *Journal of the Mendip Exploration Society & Welsh Branch*. On the winding-up of that Society in 1946, the periodical was continued as the *British Caver*, edited by Platten until his death in 1970. It was continued by Tony Oldham until the final issue (129) in April 2007.

SOURCE: Peter Mohr, and Julie Mohr 2008 Adieu: the British Caver. *Descent* 203, 26 – 27.

DESIGN AND CONSTRUCTION OF THE BRITISH LIBRARY, LONDON

The British Library building, beside St. Pancras Station, built on the former Goods Yard site, was opened to the public in 1998, replacing previous accommodation at the British Museum. Whilst the public areas and the ticket-only reading rooms are well-known, readily visible, and above ground, there is a vast multi-floored basement holding plant rooms and book-stacks. The shelving for the collections is over 140 kilometres in total length. There is an ingenious automated book delivery system, in which there is no need for horizontal transfers above the basement service area. For maximum security, books are delivered by vertical apparatus direct to each reading room.

Colin St. John Wilson's book describes and illustrates some aspects of the foundation, basements, and construction of the building, which has a stated design life of 250 years. One complication is the presence of the Northern and Circle Line tunnels, which had to be bridged-over, running below the structure.

DETAILS: Colin St. John WILSON, 1998, *The design and construction of the British Library*. London: The British Library: 96pp [ISBN 0-7123-0658-7]

[£ 14.95 at the British Library Bookshop]

HANDBOOK OF TUNNEL FIRE SAFETY

The first comprehensive professional work on fires in tunnels, international in scope, was published in 2005. Authors of the several chapters are from the UK, USA, Australia, Austria, Denmark, France, and Switzerland. Your reviewer, having passed through King's Cross underground station but a few hours before the fire there in 1987 (not to mention being missed by a V2 rocket in 1944 and by an IRA bomb at Reading Station!) cannot but find this a fascinating work. Tunnel fires have made the national headlines from time to time – notably the spectacular Summit rail tunnel fire of 1984 when 13 petrol tank waggons ignited, the Moorgate Station disaster of 1975 when a fire followed an underground crash in which 44 died, King's Cross (31 died), the Mont Blanc road tunnel fire of 1999 (39 died and 34 vehicles destroyed), the Kaprun funicular railway tunnel fire of 2000 (150 died as a result of an electrical fault), and the St. Gotthard road tunnel fire of 2001 when two HGVs collided, 11 died and 250m of the lining of the 16.9 km tunnel collapsed. Details of many more such events, worldwide, are given, from a rail tunnel fire at Meudon (France) in 1842 (150 died) onwards.

The chapter on the history of tunnel fires is followed by case studies in depth of the Channel Tunnel fire of 1996, and the St. Gotthard road tunnel fire of 2001.

Further chapters deal with prevention and detection, tunnel fire dynamics, fire management safety and human factors, and emergency procedures. Each chapter is followed by bibliographical references to primary sources. The book has a very thorough index.

DETAILS: BEARD, Alan, and Richard CARVEL (edrs), 2005, *The handbook of tunnel fire safety*. London: Thomas Telford Ltd: xxii + 514pp [ISBN 0-7277-3168-8] [Available at £ 85 at the Institution's bookshop at Great George Street, Westminster]

NEWS - PUBLICATIONS – BOOKS

TUNNELS, TOWERS & TEMPLES

Review by Stewart J. Wild, April 2009

Subtitled 'London's 100 Strangest Places', the book is a must for any capital-dweller. I found its contents irresistible: eleven chapters covering dozens of local oddities and curious histories of familiar and less-familiar places, lavishly illustrated by full-page black and white photographs. The layout is uncluttered and the index comprehensive.

Of particular interest to Sub Brit members will be the Café de Paris basement of the Rialto Cinema in Coventry Street; unfinished London Underground North End station ("Bull and Bush" on the Northern Line); Camden Town's catacombs, wharves and warehouses; the disused tunnels under King William Street; Greenwich's foot tunnel; the Kingsway tram tunnel; Brunel's famous Wapping to Rotherhithe tunnel; and a reference to World War II tunnels and bunkers still apparently hidden under Lincoln's Inn Fields.

This attractive book is available on Amazon for around half the listed price.

DETAILS: *Tunnels, Towers & Temples* by David Long, pp230 (hardback), The History Press 2008 (first published by Sutton Publishing, 2007), ISBN-13: 978-0750945097 £19.99.

STRANGEST UNDERGROUND PLACES IN BRITAIN AND THE BEST WORLDWIDE

Review by Stewart J. Wild, April 2009

This excellent little guidebook is one of a series of "Strangest" books – pubs, museums and tours are other titles – and worthy of a place on any member's bookshelf. In three chapters covering Britain, USA and Rest of the World, entries are well-written, comprehensive and illustrated by a well-chosen scattering of colour photographs. A number feature natural caverns and grottos, of course, but well over half of the more than one hundred entries detail the man-made underground burrowings that we love so much.

Many Sub Brit old favourites are described, eg Royston Cave, Dover Castle, Williamson's Tunnels, Hack Green, Kelvedon Hatch, and Ironbridge's intriguing Tar Tunnel, but there are plenty of less well-known mines, tunnels, bunkers and underground curiosities featured to satisfy even the most experienced reader.

Top overseas attractions like Wieliczka Salt Mine, the Paris and Rome Catacombs, Coober Pedy and Vietnam's Cu Chi Tunnels are fully detailed, plus many others which were new to me and have only recently come into the public domain. In the USA, I particularly enjoyed the 20,000-square-metre underground factory in Kansas City, Missouri, and the Radon Health Mines in Boulder, Colorado where, if you take a blanket and pillow, you can even spend the night. Unfortunately neither Greenbrier nor Cheyenne Mountain bunkers get a mention, but Canada's awesome Diefenbunker is fully described.

This recommended book is available from Sub Brit member Mike Moore at www.moorebooks.co.uk; E-mail: mike@moorebooks.co.uk.

DETAILS: *Strangest Underground Places in Britain and the Best Worldwide*, pp96 (softback), Strangest Books, 2006, ISBN-13: 978-0954320232 £7.99.

CAPHOUSE TO CALDER GROVE: THE STORY OF A COLLIERY MINERAL LINE, WAKEFIELD, WEST YORKSHIRE

The five-mile (8 kilometres) 'Kaye line' was built by Sir John Lister Kaye [1801 – 1871] in 1854 to link his several collieries in the countryside to the west of Wakefield with staithes on the river Calder, and with the country's main railways network. It went out of use in or about 1944.

The line, though short, was an interesting one from the point of view of railway operation. It included the single-track 400-yard (369 metres) Stocksmoor tunnel, and was worked in part by locomotives and in part by inclines worked by wire rope haulage by two stationary winding engines. The track bed remains visible in places, and a tunnel portal and relics of the engine-houses survive. A short branch served the abortive Kaye drift, a drift mine abandoned after about 1000 yards in the 1920s.

This history, written in or about 1987 but hitherto unpublished, contains much information about the collieries and their owners and managers, and much of course about the railway and those who operated it.

DETAILS: Malcolm M. TILL, 2007, *Caphouse to Calder Grove: the story of a colliery mineral line.* Overton: National Coal Mining Museum for England: vii + 68pp [ISBN 978-1-872925-11-0] [Available from the National Coal Mining Museum for England, New Road, Overton, WAKEFIELD, West Yorkshire WF4 4RH / www.ncm.org.uk]

RAILWAY TRACK DIAGRAMS 5: SOUTHERN & TRANSPORT FOR LONDON

The railway track diagrams series was started in 1988 by the former Quail Map Company of Exeter, and is now being continued by Trackmaps of Bradford-on-Avon. There are five volumes covering the whole of Great Britain, excluding Northern Ireland, but including the Isle of Man and the Channel Islands. They each cover, more or less, the old British Rail regions. The third edition of book 5 has now been revised and reprinted. The other volumes are for Scotland and the Isle of Man; London North Eastern & East Anglia; Western; and Midlands & North West.

The new edition of Book 5 is impressively printed, with 50 pages of colour-coded maps (and an index map), two pages of explanations for symbols and abbreviations, and an 11-page index. It covers London, southern England (south of Reading) and all the way down via Salisbury to Exeter; and Alderney, although it seems there are no operating lines of any kind on Guernsey or Jersey.

It shows huge numbers of technical details of all currently operating lines, including of course railway tunnel names, lengths, and so forth. The scope and detail are impressive. Apart from the main-line railways, the London Underground, the Docklands Light Railway, Croydon's Tramlink, the new Channel Tunnel Rail Link and the Channel Tunnel itself (and the French terminal) are all featured. So are details of track layouts in carriage sidings and industrial premises, along with a surprisingly large number of privately operated heritage or tourist railways, such as that at the Amberley Working Museum (East Sussex) and two on Alderney (Channel Islands)! You will find here, also, all the bits of London Underground's system remaining in operational use but never shewn on the familiar published maps or traversed by trains in passenger service, such as the siding used for parking train sets between the running tunnels between the (closed) Down Street station and Hyde Park Corner. Gerald Jacobs worked within the railways for 40 years, and has drawn on internal Network Rail and LUL sources as well as material in the public domain.

Abandoned lines and tunnels are not shown. The best comprehensive guide to those is Michael Cobb's monumental two-volume *Railways of Great Britain: a historical atlas* published by Ian Allan Publishing Ltd in 2003 (and reprinted in 2005).

DETAILS: JACOBS, Gerald (edr), 2008, *Railway track diagrams 5. Southern & TfL. 3rd edition*. Trackmaps: 70pp [ISBN 978-0-9549866-4-3] [£ 14.95 from the Ian Allan Bookshop at 45 – 46 Lower Marsh, London SE1 7RG (just round the corner from Waterloo Station)]

NEWS - PUBLICATIONS – PERIODICALS

KENT UNDERGROUND RESEARCH GROUP – NEWSLETTER 96 (2008)

FARRER, Hugh, 2008, Well at Crouch. *Newsletter Kent Underground Research Group* 96, 1 – 2 [Near Sevenoaks / dry to infill at 33.7m / associated with a house built in ? 1721 / possibly the site of a former house in 1459]

HARWOOD, Angie, 2008, Well at Ramsgate. *Newsletter Kent Underground Research Group* 96, page 2 [Ellington Park / 60 feet]

LE GEAR, Rodney F., 2008, Another denehole at Northfleet. *Newsletter Kent Underground Research Group* 96, pages 4 and 6 [Includes plan and section]

LE GEAR, Rodney F., 2008, Chalkwell at Wrotham. *Newsletter Kent Underground Research Group* 96, 2 - 3 [Includes plan and section]

NORTHERN MINE RESEARCH SOCIETY – BRITISH MINING 86 (2008)

The latest issue of the Northern Mine Research Society's *Memoirs*, British Mining, contains papers as follows:

CALLENDER, R.M., 2008, Photography underground. *British Mining* 86, 59 – 67.

GILL, Michael C., 2008, The Great Dales coalfield, eastern areas. *British Mining* 86, 68 – 1-8 [Yorkshire]

JAMES, David M.D., 2008, The East Van failure, Powys, Wales: a new look at the geology and the archival record. *British Mining* 86, 109 - 121.

JOHNSON, David, 2008, Excavation of a seventeenth-century lime kiln at Kilnsey, North Yorkshire. *British Mining* 86, 31 – 46.

LAMB, Richard P.H., 2008, The Newcomen engine and the account book of Edward Short: a detailed reappraisal. *British Mining* 86, 122 – 146 [Accounts kept 1714 – 1717 relating to a Newcomen engine at Bilston colliery near Wolverhampton]

SMITH, Richard, 2008, Lead smelting mill at Scargill. Co. Durham. *British Mining* 86, 47 - 58.

VERNON, Robert M., 2008, Alfred Williams, Leo Daft and 'The Electrical Ore-Finding Company Ltd'. *British Mining* 86, 4 – 30 [Deals with the pioneering work in geophysical prospecting of Leo Daft [1843 – 1922], Alfred Williams [1871 - ????], Williamstow Ltd (registered 1900) and the same company renamed the Electrical Ore-Finding Company Ltd (1902); and the use of this at Cwmystwyth and Talacre mines (North Wales), Dolcoath mine (Cornwall) and elsewhere including Spain and Australia]

AVAILABILITY: *British Mining* 86 (147pp) can be obtained from Barbara Sutcliffe (NMRS Publications), The Old Manse, 93 Halifax Road, NELSON, Lancashire BB9 0EQ (T) 01282-614615
Email mansemins@btopenworld.com
The Northern Mine Research Society's website is www.nmrs.co.uk .

PEAK DISTRICT MINES HISTORICAL SOCIETY – BRITISH MINING 17(1)

The latest issue of *British Mining*, the Bulletin of the Peak District Mines Historical Society, labelled Summer 2008 but evidently actually published in February 2009, contains two substantial papers on Derbyshire coal and ironstone mines:

HEATHCOTE, Chris, 2009, Coal mining in the hamlets of Beard and Bugsworth in northwest Derbyshire: 1650 to 1926. *British Mining [Bull. Peak District Mines Historical Society]* 17(1) (for Summer 2008), 1 – 17 [Published 2/2009] [Includes details / maps relating to canal and railway connections including tramways of c. 1799 and c. 1850]

NAYLOR, Peter J., 2009, The mines and forges of the lower Derwent valley, Derbyshire, covering the Duffield Frith, Heage, and beyond. *British Mining [Bull. Peak District Mines Historical Society]* 17(1) (for Summer 2008), 18 – 53 [Published 2/2009] [Coal, ironstone, flagstones &c / Includes details / maps relating to canal, turnpike road, tramway, and railway connections including tramways]

PEAK DISTRICT MINES HISTORICAL SOCIETY NEWSLETTER 128 (October 2008)

The principal contents are:

ADLAM-STILES, Niki, 2008, Access arrangement – Dream Hole and Fox Hole, Wirksworth. *Newsletter Peak District Mines Historical Society* 128 (October 2008), page 4.

BARNATT, John, 2008, Peak District Mines – observations and discoveries – part 27. *Newsletter Peak District Mines Historical Society* 128 (October 2008), 8 - 10 [Lead mining remains in Ible Wood, Ible, Derbyshire, SK 2535 5670 to SK 2580 5645 / Stream tunnel near Countess Cliff Farm, Harpur Hill, Buxton, Derbyshire, SK 056 708 / Possible mine road to Mam Engine Shaft, Oden (Odin) mine, Derbyshire, SK 1275 8330 to SK 1300 8330]

BROWN, Ivor J., 2008, Watersaw mine. *Newsletter Peak District Mines Historical Society* 128 (October 2008), page 7 [Glebe Mines Ltd / Institute of Materials,

Minerals and Mining visit report / abstracted from *Materials World*]

BURGESS, Peter M., 2008, Review of *Snailbeach lead mine, Shropshire*. *Newsletter Peak District Mines Historical Society* 128 (October 2008), 2 – 3.

DIBBEN, Nigel, 2008, Coal mine fatality. *Newsletter Peak District Mines Historical Society* 128 (October 2008), page 2 [Peter Ireson died in oxygen-deficient air in shaft]

FLINT, Stewart G., 2008, Lead mining records. *Newsletter Peak District Mines Historical Society* 128 (October 2008), page 3 [Notebooks of Samuel Joseph Sheldon]

MASSON CAVING GROUP, 2008, Masson Caving Group – 30th anniversary celebrations. *Newsletter Peak District Mines Historical Society* 128 (October 2008), page 10 [Group established April 1979]

THOMPSON, Steve, 2008, Shaft on Horsestead mine, Taddington at SK 14330 71573. *Newsletter Peak District Mines Historical Society* 128 (October 2008), 7 – 8.

LONDON RAILWAY RECORD 54 (January 2008)

Includes two papers of underground interest:

BEARD, Tony, 2008, Tunnel Vision: the Lower Thames Tunnel and New Connecting Railway. *London Railway Record* 54, 21 - 24.

EMMERSON, Andrew, 2008, Operating Whitecross Street Depot. *London Railway Record* 54, page 30.

NEWS - TUNNELS AND TUNNELLING

DEATH OF ERIC (DIGGER) DOWNING OF THE 'GREAT ESCAPE'

Squadron-Leader Eric Downing [1915 – 2008], who helped dig at least one of the escape tunnels from the Stalag Luft III prisoner-of-war camp during World War II, has died one day short of his 93rd birthday. He was born at Glastonbury (Somerset) on 22 July 1915, and joined the RAF at the start of the war in 1939. He was shot down over enemy territory in April 1942 and, on reaching the camp, was recruited to the escape tunnel digging team. Although elected one of the 250 would-be escapers, he remained behind the wire as the 77th man was detected during the breakout on 24 March 1942. Of those who got out, three reached safety, 50 were shot on Hitler's orders, and the remainder returned to custody. Downing, who died in a nursing home near Bristol on 21 July 2008, felt that the 1963 film of Paul Brickhill's book on 'The Great Escape' did not truly reflect the reality of digging the three tunnels (Tom, Dick, and Harry) at the camp.

SOURCE: Richard ALLEYNE, 2008, 'Digger' Downing, the real hero of the Great Escape, dies at 92. *Daily Telegraph*, 7 August 2008.

MARLEY RAILWAY TUNNELS, DEVON

The two 868-yard single-track Marley tunnels between Totnes and Ivybridge were made in 1848 and 1893, on the main line to Plymouth and Penzance. One of the tunnels, featured in a recent photograph in *Railwatch*, is currently undergoing renovation, commencing in January 2009.

SOURCE: ANON, 2009, Light at the end of the tunnel. *Railwatch* 119, page 1.

WORK ON TESCO'S TUNNEL RECOMMENCED, GERRARDS CROSS, BUCKINGHAMSHIRE

Three and a half years after its collapse, work recommenced in February on the 'TESCO' tunnel (a roofed-over cutting) at Gerrards Cross on the Chiltern Railways main line. The idea is to build a supermarket on top of the roofed-over cutting.

SOURCE: ANON, 2009, Gerrards Cross Tesco tunnel work resumes. *Modern Railways* 66(726), page 15.

A NEW THAMES TUNNEL, LONDON

An extension to the Docklands Light Railway, connecting King George V Station to a new DLR Station adjoining Woolwich Arsenal Station, opened to public traffic on 10 January 2009. As the DLR trains are driver-less, you can sit at the front windows and enjoy grandstand views of the new tunnels (there are separate northbound and southbound bores) which are lit, and have a walkway along one side for use for inspection, maintenance, or in emergencies. The tunnels were completed, reportedly, 'well on time, seven weeks early, and also well within budget.'

SOURCE: ANON, 2009, DLR Woolwich Arsenal route opens. *Modern Railways* 66(725), page 8.

SOURCE; ANON, 2009, [Docklands Light Railway] *Greater London Industrial Archaeology Society Newsletter* 240, 7 – 8.

FURTHER DETAILS FOR CROSSRAIL, LONDON

A recently published report on London's proposed Crossrail line includes a map shewing the entire line and stations from Maidenhead to Whitechapel, and branches thence to Abbey Wood and Shenfield. Vertical sections show schematically the variations in gradient and tunnel depth below central London, and the new tunnel's spatial relationship with existing tube line tunnels, other service tunnels, a low-level sewer, the Blackwall road tunnels and the mothballed Post Office Railway, some of which will lie above the Crossrail line, others below it. The Abbey Wood branch will also pass under the river Thames.

Some details for central London subsurface station sites are also given. At Tottenham Court Road Station, the Astoria Theatre on Charing Cross Road will be demolished. At Farringdon Station, two Crossrail platforms will be fitted out to 210 metres, but with provision for extension to 245 metres should the need

for longer trains arise. At the Liverpool Street Crossrail Station (between the existing Liverpool Street and Moorgate stations) the ticket hall will be within Moor House (built four years ago), which already has a 40 metre deep draught relief shaft incorporated within it – one part of the new underground railway already in existence. At the Whitechapel Station, the North Eastern Storm Relief Sewer is to be diverted, and an electricity sub-station relocated. The Isle of Dogs Station is to be built below the West India North Dock, which is to be drained for three years; groundwater abstraction from this location will result in lower water levels in 25 licensed water extraction sites nearby.

An advertisement placed by the City of London in the London *Metro* of 8 December 2008 announced 'City finalises Crossrail deal': this announced the signing of a £350m deal 'to deliver Europe's largest construction project, Crossrail, on time and on budget.'

The *Daily Telegraph* of Friday, 13 February 2009, carried a number of advertisements for appointments related to CrossRail, including posts as Project Manager, Site Security Specialist, IT Project Manager, Technology Strategist, Information Security Specialist, and Systems Assurance Engineer.

ANON, 2008, Crossrail from drawing board to reality. *New Civil Engineer*, 6 November 2008, 50 – 55.

TRYHORN, Chris, 2008, Crossrail narrows funding gap with City pledge of up to £350. *The Guardian*, 5 December 2008, page 40 [Includes photograph of completed shaft at Moor House]

NEW BAGGAGE TUNNEL PROPOSED FOR HEATHROW AIRPORT, LONDON

Heathrow Airport already has a short baggage tunnel. A much longer new one is now proposed to link all terminals. A recent report includes a schematic map to show the existing and proposed tunnels in relation to buildings and runways.

SOURCE: Jessica ROWSON, 2008, Transform Heathrow. *New Civil Engineer*, 30 October 2008, 22 – 27.

SOME UK RAILWAYS INFRASTRUCTURE STATISTICS

The United Kingdom's railways infrastructure (70% of it over a century old) includes the following:

Tunnels	700 – with a total length of 400 km
Bridges	40,000 – half of them masonry
Earthworks	20,000 km – cuttings / embankments
Stations	2517

It is not clear from the report cited if these figures include, or not, Transport for London's underground railways, and its three tram tunnels in Croydon.

SOURCE: ANON, 2009, Infrastructure longevity. *Evolution*, January 2009, 6 – 7 [*Evolution* is published by the Construction Industry Research & Information Association]

THE CHANNEL TUNNEL RAIL LINK

Ken Cordner has had a number of authoritative articles on the Channel Tunnel, and on the new Channel Tunnel Rail Link from Folkestone to London St. Pancras International, published in *Modern Railways* from the 1990s onwards. He has now authored a book on High Speed 1, as the new line has been called, implicitly supposing the UK will build at least a second such high speed line, presumably northwards from London.

This is a well-illustrated account of the planning and construction of the line, which has altogether something like15 new rail tunnels in east London and across Kent. The locations of all of these tunnels (and in some cases their associated shafts) are given in a series of technically detailed maps of the route. The sum total length of all these tunnels adds up to 29.44 km (more than half the length of the Channel Tunnel itself). The technically interesting long bored tunnels are the twin tube London Tunnels 1 and 2 (between St. Pancras and Dagenham, with a short open stretch at Stratford International), a new Thames Tunnel from Essex to Kent, and the North Downs Tunnel. Many of the short tunnels are cut-and-cover 'land bridges' to mitigate the division of property by the new railway, and to reduce noise pollution in the districts traversed. Of the 29.44 km of tunnels, 4.24 km are of 'cut-and-cover' construction. Although, on account of all these tunnels (not to mention the open cuttings), the Eurostar trains are of limited attractiveness to passengers who like to view the passing scenery, this slim work would nevertheless make a worthwhile book to take with you *en route* to Brussels or Paris, as it explains exactly where you are in relation to other features along the line.

There is a substantial section on the conversion of the old St. Pancras Station into the modern International terminus, including the work on the former beer-storage vaults (now a public circulation area with Eurostar arrival and departure lounges, shopping malls, and so forth) and on the making of the new sub-surface St. Pancras International Station on the through Brighton to Bedford 'Thameslink' lines.

The whole volume is lavishly provided with colour photographs featuring, *inter alia*, subterranean and surface views of construction in progress, and aerial views of the route and major structures.

DETAILS: CORDNER, Ken, 2008, *Tunnel vision*. London: Ian Allan Publishing: 96pp [ISBN 978-0-7110-3342-9] [On sale at the Ian Allan bookshop at Waterloo for £14.99]

DEEP-LEVEL SEWER PROPOSED BELOW THE RIVER THAMES, LONDON

London's sewerage system, based in the 19th century on Bazalgette's plan for a city of only four million inhabitants, is currently by-passed in prolonged wet weather. This results in 32 million cubic metres per annum

of storm sewage being discharged direct and untreated into the river Thames and its major tributary the Lee. Plans are advanced for a London Tideway Tunnels scheme, incorporating 39 kilometres of what would when completed be the capital's deepest tunnels.

The main Thames tunnel (32.2 km) is proposed to follow the course of the river, other than at North Greenwich where a short cut below the land and the Blackwall Tunnel approach road will be taken, south of the Dome. This is to run from a pumping station at Hammersmith to another at Beckton, where the sewage is to be pumped up to the Beckton Sewage Treatment Works. The Thames tunnel will be so large (7.2 metres in diameter) that it will effectively double-up as a storage reservoir as well as a conduit. It is to take stormwater from 36 overflow points. A hundred and fifty test-bores are being made to test subsoil conditions. As so many of London's existing tunnels are in the London Clay (an ideal tunnelling medium), the Thames Tunnel will have to go deeper, through more problematic Woolwich & Reading Beds, and pervious Thanet Sand and Upper Chalk. At least three and possibly five wide shafts will have to be sunk across central London, to allow the emplacement of the tunnel-boring machines to be used. Discussions are being held with affected London Boroughs concerning the siting of these shafts, which should be as close to the river as possible. It is expected that construction will take from 2012 to 2020.

A further 7km tunnel is to take stormwater away from the river Lee, via a tunnel from the Abbey Mills Pumping Station to Beckton. This is to commence at a depth below ground level of 60 metres, falling to 75 metres down at Beckton. This relatively straightforward tunnelling project is expected to be commenced in 2009, and completed in 2014.

The Beckton Sewage Treatment Works is, of course, to be enlarged.

SOURCE: Alexandra WYNNE, 2008, Thames rescue. *New Civil Engineer*, 9 October 2008, pages 30 and 32.

COMBINED FLOOD BARRIER, TIDAL POWER PLANT AND TUNNEL UNDER THE THAMES PROPOSED, ESSEX / KENT

A new tunnel linking Essex to Kent could be combined with a new Thames Barrier also incorporating a tidal power plant, it has been suggested. The proposal has been included on an official list of 'options' for further consideration. An alignment from near Canvey Island (Essex) to the Medway towns in north Kent is envisaged.

SOURCE: Damian ARNOLD, 2008, Mega-tunnel to cross Thames. *New Civil Engineer*, 11 September 2008, page 10.

PROPOSED USE OF PART OF SCOTLAND STREET TUNNEL AS A YOUTH CLUB, EDINBURGH

Scotland Street tunnel, a disused railway tunnel from Edinburgh Waverley Station towards Leith, may be part-used to house a youth club, it has been reported in the *Edinburgh Evening News*. The blocked southern end can be seen from the northernmost platform at Waverley. The tunnel runs below Edinburgh New Town to Scotland Street, where the walled-up portal can be seen in a small children's playground. The tunnel was visited by the Grampian Speleological Group in 2001 (there is a report by Peter Dowdswell of the visit in *Newsletter GSG* 109, 4 – 5 (2001)) but a few years later, when Subterranea Britannica held its study weekend based in the city, it proved impossible to locate a keyholder. The club, proposed to occupy 10 metres only of the tunnel, presumably at the north end, is promoted by the local police, with £50,000 being looked for to meet the costs. According to the Institution of Civil Engineers' volume in the Civil Engineering Heritage series, the tunnel was made in 1844 – 47, and abandoned for railway purposes in 1868, since when it has found occasional use as a mushroom farm and as a World War II air-raid shelter.

SOURCE: ANON, 2008, Scotland Street Tunnel to be youth club. *Newsletter Grampian Speleological Group* 137, page 9.

SECOND TYNE ROAD TUNNEL TO BE MADE COMBINING THREE TUNNELLING TECHNIQUES, DURHAM / NORTHUMBERLAND

A single-bore two-lane 3.1 kilometre rock-bored road tunnel was opened under the Tyne, downstream from Newcastle, in 1967. In the light of disastrous tunnel fires in recent years, and of increased road traffic, a second tunnel, to the east, is now being planned. This new single-bore two-lane tunnel, from Jarrow (on the Durham bank of the river) to East Howden, will be shorter (1.5 kilometres) and shallower than the older structure. It will be made, under the water (360 metres), by the immersed tube technique; the north and south approaches will be of cut-and-cover construction with, additionally, two short lengths (of 31 metres and 40 metres) incorporated in the southern approach, where conventional tunnel driving through rock is to be used, this being seen as the best way to pass above or below existing services such as sewers without disturbing them. The bored tunnel sections will be lined with sprayed concrete. On the north bank, the new tunnel will pass above the old one, three metres lower.

The immersed tube will be of four 90-metre-long concrete box sections, which will be lowered into a trench in the river-bottom sediments.

Completion of the new tunnel is scheduled for December 2010. On this being opened to traffic, the old tunnel will

be temporarily closed for upgrading: primarily the provision of a walled-off safety corridor for escape in the event of fire. When this work is completed, expected to be in 2011, the old tunnel will be for northbound traffic only, and the new one for southbound vehicles.

Alexandra Wynne's report includes a map shewing both tunnels, and a vertical section.

An earlier report (in August 2008) was to the effect that work on casting the four concrete box sections was to commence in September. Dredging was already under way to create the trench into which these are to be lowered.

SOURCE: Alexandra WYNNE, 2008, Tyne tunnel gets under way. *New Civil Engineer,* 21 August 2008, page 6.

SOURCE: Alexandra WYNNE, 2008, Tunnels: Tyne crossing. A road runs through the river. *New Civil Engineer New Concrete Engineering Supplement*, October 2008, pages 24 – 25.

NEW SEWERS FOR BELFAST, NORTHERN IRELAND

Belfast's new sewers project is 'one of the most ambitious infrastructure schemes in Northern Ireland, and the biggest tunnelling project in the whole of Ireland' according to a report from Seán Flynn. Contractors Farrans and Morgan are currently tunnelling below the city, where improvements are being made to the largely Victorian 1,800 km sewers network. His report includes a map shewing the new sewers in relation to natural waterways and principal city streets.

SOURCE: Seán FLYNN, 2008, Belfast burrows. *New Civil Engineer*, 9 October 2008, pages 40 and 42.

PENTWYN-MAWR TUNNEL ON HALL'S TRAMROAD, ABERCARN

A recent article in *Archive* notes a 540-yard single-track tunnel made in 1809–10 for horse-drawn waggons, but enlarged to take standard-gauge rail vehicles at some time between 1853 and 1860. The line ran through Ebbw Vale in South Wales.

FROWEN, Foster, 2008, Hall's tramroad: Abercarn. Part four. 1879 – 1900. From tramroad to railway. *Archive* 60, 17 – 39.

UNDERGROUND METRO AND TRAM SYSTEMS FOR ABU DHABI

Abu Dhabi has at present around one million inhabitants, and is growing rapidly: it is expected to treble in the next 20 years. Congestion, and high ambient temperatures, make walking about the city centre, as well as driving, unwelcoming options. Plans are being made for extensive interconnecting high speed rail (with a link to Dubai), and underground metro and tram systems. The metro and tram system under consideration incorporates 100 kilometres of track, largely in tunnel. There is already an underground metro system under construction in nearby Dubai.

SOURCE: Colin SHERWOOD, 2008, Middle East report: getting things moving. *New Civil Engineer*, 2 October 2008, 26 – 27.

DUAL PURPOSE TUNNEL UNDER CONSTRUCTION AT KUALA LUMPUR, MALAYSIA

An innovative tunnelling scheme in course of construction in the capital of Malaysia has been nominated for a British Construction Industry Award. The 9.7 km tunnel under the city centre, illustrated in course of construction in the report, can be used when required as a floodwater tunnel or, at other times, as a road tunnel. It has a diameter of 11.8 metres.

SOURCE: ANON, 2008, Storm water management and road tunnel, Kuala Lumpur. *New Civil Engineer*, 11 September 2008, page 30 [Malaysia]

SOURCE: Antony OLIVER, 2008, Stormwater management and road tunnel (SMART) *New Civil Engineer Supplement [British Construction Industry Awards 2008]*, page 33.

[Malaysia: Kuala Lumpur: 9.7 km / 11.8m diameter flood diversion tunnel]

NEW TUNNEL FOR SUBURBAN TRAIN SERVICES IN MADRID, SPAIN

A new 8.5 km rail tunnel opened on 9 September 2008 to link the Atocha and Chamartin main line stations in Madrid. This will allow local trains from Aranjuez and Parla to run through to Chamartin rather than terminating at Atocha as previously. There are two new intermediate stations, with good connections to the Madrid Metro: Neuvos Ministerios is already open, and Puerta del Sol is scheduled to open in 2009.

SOURCE; ANON, 2008, New tunnel in Madrid. *Modern Railways* 65(722), page 68.

BUSCH TUNNELS, BELGIUM / GERMANY

Increased capacity on the line from Brussels to Köln has been provided by the driving of a second Busch rail tunnel. The first 700-metre tunnel, made in 1843, is now to be upgraded, and the double track singled. On completion in December 2010, trains will run eastbound through the old tunnel, and return west through the new one, with higher running speeds.

SOURCE: ANON, 2008, Busch tunnel progress. *Modern Railways* 65(720), page 101.

ACCURATE MAPPING OF TUBE TUNNELS, LONDON

Accurate and efficient measurement of London Underground tunnels is the aim of Laser Rail's laser measuring system, which won the Innovation in Engineering Award. Designed to capture continuous spatial data of the railway infrastructure, it establishes safe gauge clearance to support London Underground modernisation and maintenance.

The capture of spatial information based in the principles of triangulation uses proven optical measurement

techniques combined with digital technology. The clearance information is coupled with track gauge, cant and flexible outputs and incorporated in a user-friendly data management system. The system is being prepared for use by Metronet on the Victoria and Central Lines.

SOURCE: ANON, 2008, Accurate mapping of tube tunnels. *Modern Railways* 63(695), page 34.

CAPTURE OF COLD RIVER TYBURN WATER TO COOL VICTORIA LINE UNDERGROUND STATION, LONDON

A planned trialling of a cooling system for Victoria Underground Station's Victoria Line platforms is reported. Groundwater at 12°C from a depth of 30m, thought to be from the buried river Tyburn, was proposed to be pumped through heat exchangers in which electrically driven fans would blow warm station air through an array of cold-water-carrying pipes. Where the resulting warm water was to go is not clear. The system, which would have to remove the additional heat generated by operation of the electric fans, was thought capable of reducing station temperatures by three to five degrees centigrade. It was suggested that other stations with ready access to suitable water sources (such as South Kensington's deep-level Piccadilly Line platforms) might also employ this technology. However, as most of London's tube tunnels are not large enough to accommodate water pipes, other means will have to be found for cooling other busy deep stations.

SOURCE: ANON, 2006, Underground water could hold key to cooling London's Tube stations. *Ground Engineering* 39(8), page 6.

GLENDOE HYDROELECTRIC POWER STATION TUNNELS AT FORT AUGUSTUS, SCOTLAND

Details have been reported of underground works in connection with the Glendoe Hydroelectric Project, expected to be completed by late 2008 or early 2009. Water will be collected at 19 points in the Monadhliath Mountains to the southeast of Loch Ness, and conveyed via a seven kilometres aqueduct tunnel to a dammed reservoir, and thence via a 6.2 km headrace tunnel to a power station near Fort Augustus, from which another 1.8 km tailrace tunnel will deliver it to Loch Ness.

Damon SCHÜNMANN, 2006, Tunnelling Loch solid energy. *Ground Engineering* 39(8), 16 - 17.

NUCLEAR WASTE BURIAL RECOMMENDED

The government-appointed Committee on Radioactive Waste Disposal has considered three means of handling the UK's 500,000 cubic metres per annum of intermediate-level waste: (1) temporary surface storage for 300 years; (2) disposal in a geological repository between 300 and 1000m deep, to be sealed immediately; and (3) phased geological disposal in a deep repository kept open for several hundred years to allow monitoring and possible retrieval. Option 2 is recommended as the only viable solution.

SOURCE: ANON, 2006, Underground nuclear waste burial recommended. *Ground Engineering* 39(8), page 5.

BRITISH TUNNELLING HISTORY: MINES AND CANAL TUNNELLING

A short article traces the history of development of tunnelling from mining operations, noting James Brindley's interconnecting canal tunnels and coal mine galleries at Worsley (Greater Manchester), the importance of surveying (especially, for canals, levelling), and the driving of the brick-lined Netherton canal tunnel with a span of eight metres – wide enough for two boats to pass, and with a towpath each side. The earliest railway tunnels, as at Liverpool, are also noted.

SOURCE: ANON, 2006, British tunnelling: a short history. *Ground Engineering* 39(8), page 28.

MAPPING JOINTS IN THE BRICKWORK OF VICTORIAN RAILWAY TUNNELS AS A CLUE TO CONSTRUCTION METHODS

A recent paper in *Ground Engineering* discusses maintenance problems for brick-lined railway tunnels, of which 628 are reported to remain in operational use in the UK, with another 200 or so out of use. Most were built between 1830 and 1900, but usually there is no detailed surviving documentation. An exception is the New Colwall tunnel under the Malvern Hills between Great Malvern and Hereford. This 1589-yards bore was driven in 1924–26 to replace the Old tunnel of 1853–61.

Long tunnels are excavated, and spoil is extracted, from a series of vertical shafts, from the bottoms of which tunnel headings are driven in each direction. Ultimately, all the separate bits of tunnel meet. Usually, a small pilot tunnel just large enough to walk in is driven right through at finished tunnel-floor level, to drain the works and assist ventilation. Brickwork linings in the tunnel lengths immediately either side of each shaft had to be especially thick and strong to support the weight of the shaft lining. The collapse of the Watford tunnel during construction with the loss of the shaft, part of the tunnel, and several lives, is though to have led to the evolution of a tunnelling technique in which 'breakups' or lengths of full-diameter lined tunnel were created from the pilot tunnel between the shaft-bottoms, before the tunnel was opened out to full diameter immediately beside each shaft. It is not stated if this was the Watford Old tunnel (1515 yards) of 1834–37, or the Watford New tunnel (1990 yards) of 1874.

Thus it is known that there were 40 gangs of tunnel miners employed in making the Chipping Sodbury tunnel (4444 yards, made 1898–1903), although this had only seven shafts, implying 16 gangs (two each from the base of each shaft, and one from each end.)

Careful surveying of joint patterns in the brick linings of tunnels can be used to determine the methods used, and

in particular the 'lengths' in which the tunnel was lined, generally about 4.5m in good conditions, but as short as two or even one metres in bad ground.

SOURCE: Jack KNIGHT, and Scott WILSON, 2006, Technical note: tunnel vision. Victorian brick tunnel joints provide clues to their construction that can help improve maintenance and reduce costs. *Ground Engineering* 39(8), 26 - 28.

GLOBAL CROP DIVERSITY TRUST'S GLOBAL SEED VAULT, SPITSBERGEN (SVALBARD), NORWAY

An estimated 75% of the world's crop species has been lost in the last century. A continuing loss of genetic diversity on this scale, even in the absence of natural of man-made disasters, is alarming. Although many of these species were, in themselves, not of immediate use as crops, many of them could well (had they survived) have been of immense importance in breeding new varieties of crops. This problem is addressed, in a limited way, by establishments such as the farm at Brogdale, Kent, where numerous species of, for example, apples and pears are kept in cultivation as potential sources of genetic material, if not of edible fruit.

The Government of Norway has created a Global Seed Vault on the island of Spitsbergen, in the Svalbard archipelago. This takes the form of a tunnel 400 feet long driven into the permafrost and bedrock of a mountainside. Approximately 500 seeds of each of 1.5 million agriculturally important species are to be lodged here at a temperature of -18°C, guaranteeing an estimated 19,500 years of viability. The seeds remain the property of each depositing country. From time to time, it is proposed to take some of each sort of seeds to be planted and harvested, yielding fresh seeds for deposit in the place of the older ones withdrawn, making indefinite prolongation of viability practicable.

In the event of failure of the refrigeration systems, the vault would 'warm up' to as high a temperature as -3.5°C, still cold enough to preserve the seeds for more than long enough for repairs to be effected. The idea is to safeguard the genetic information in the seeds in the event of crops on the surface being killed off by natural disasters, or man-made events such as climate change, nuclear war, and so forth.

The islands of Svalbard enjoy an average temperature of -6 °C, with 24-hours darkness from November to January. Polar bears are thought, almost, to outnumber the human population (including Russian coal-miners at Longyearbyen) of almost 2,400 persons. About 60% of the archipelago is glaciated. The facility is thought to be one of the most secure places on earth, in a remote and hostile environment, with remotely controlled steel air-lock doors, motion sensors, and guarded by polar bears. It is managed by the Global Crop Diversity Trust.

SOURCE: ANON, 2008, Ark in the Arctic. *Barometer [Met Office Magazine]* 10, page 4.

WATER SUPPLY TUNNELS FOR VANCOUVER, CANADA

A water-supply scheme for Vancouver, western Canada, had been described, in which water from the Capilano Reservoir will be pumped through a 3.88m diameter 7.2 km tunnel to a filtration plant which will also take water from the Seymour Reservoir. From there the water will flow through another tunnel, of the same dimensions as the first, to the area to be served. Both tunnels are to be driven by tunnel-boring machines from a start chamber 11.5m in diameter at the bottom of a 180m deep shaft at the filtration plant location.

SOURCE: GREEMAN, Adrian, 2006, Tunnelling Rocky Mountain way. *Ground Engineering* 39(8), page 18.

DRUG-SMUGGLING TUNNEL, MEXICALI, BAJA CALIFORNIA STATE, MEXICO

Mexican police have arrested eight drug-smugglers as a result of their tunnelling under the border towards Calexico in California, USA. They had reached within 65 yards of the border. Their tunnel, 15 feet down, being reportedly 150 yards long when found, was provided with air conditioning, an electric railway, and a lift. At least 75 such tunnels have been found along the 2,000-mile Mexican / USA border, intended for smuggling drugs or illegal immigrants. In 2006 the largest of these was discovered running from Tijuana (Mexico) towards San Diego (California, USA.) This 787-yard tunnel was made below an intensively patrolled length of the international border,

SOURCE: Catherine ELSWORTH, 2008, Drug-smugglers' tunnel has all mod cons. *Daily Telegraph*, 4 September 2008, page 16.

SHANGHAI – CHANGXING ROAD TUNNELS UNDER THE YANGTSE RIVER, CHINA

The despatch to China of two 2,300 tonne tunnel-boring-machines (TBMs) each 125m long and 15.43m diameter has been reported. They were due in 2006 to commence driving a pair of three-lane road tunnels from Shanghai (mainland China, population 20m) to Changxing Island (in the Yangtse estuary, population 600,000). The first bore is due to be completed at the end of 2008, and both tunnels to open for traffic in April 2010.

SOURCE: ANON, 2006, World's largest TBMs head for China. *Ground Engineering* 39(8), page 5.

South Kensington Station and the District Line deep-level express tube line

By Nick Catford

Early History

As part of a proposal to link the recently opened London main line railway termini, the Metropolitan Railway (MR) obtained an Act of Parliament in 1854 to construct an underground railway between Paddington and Farringdon Street via Kings Cross; this was to become the first section of London's underground railway system.

Construction of the cut-and-cover line started in February 1860 and the new line opened to the public on 10 January 1863. The Metropolitan or 'Met' was an immediate success and was soon carrying 26,500 passengers daily with a short extension east to Moorgate Street opening on 23 December 1865.

There was a junction with the Great Western Railway at Paddington and the Met's broad-gauge line was initially worked by the Great Western using its own stock. This arrangement was short-lived however and after a massive disagreement between the two companies, the GWR withdrew from the agreement. The Met was now forced to work the line itself with the help of the Great Northern Railway using their standard-gauge stock; the broad-gauge track was finally removed in 1869.

The Metropolitan Railway extended their line southwards from Praed Street (Paddington) to Gloucester Road on 1 October 1868 with a further extension to South Kensington to join the Metropolitan District Railway (MDR) which was building a line west from Westminster. The joint MR and MDR station at South Kensington opened on 24 December 1868. The MDR extended their line east to Mansion House on 3 July 1871 and although the companies remained independent and were indeed rivals, each company operated its trains over the other's tracks in a joint service known as the 'Inner Circle' although the circular route itself wasn't completed until 6 October 1884.

As built, South Kensington had two island platforms and two side platforms with four lines (see plan). The island platforms had a fifth track between them used for terminating and reversing Metropolitan trains arriving from the west. In 1885 the MDR opened a long pedestrian subway from the station beneath the length of Exhibition Road giving sheltered access to the newly built museums; there was a toll on using the passage until 1908.

The Deep-level Metropolitan District express line

By the beginning of the 20th century, the MDR had built extensions to Richmond, Ealing, Hounslow and Wimbledon and was suffering considerable congestion on the southern section of the Inner Circle between South Kensington and Mansion House. Between these two stations it was running an average of twenty trains an hour, with more in the peak periods, which meant there was a permanent smoke-laden atmosphere in the tunnels.

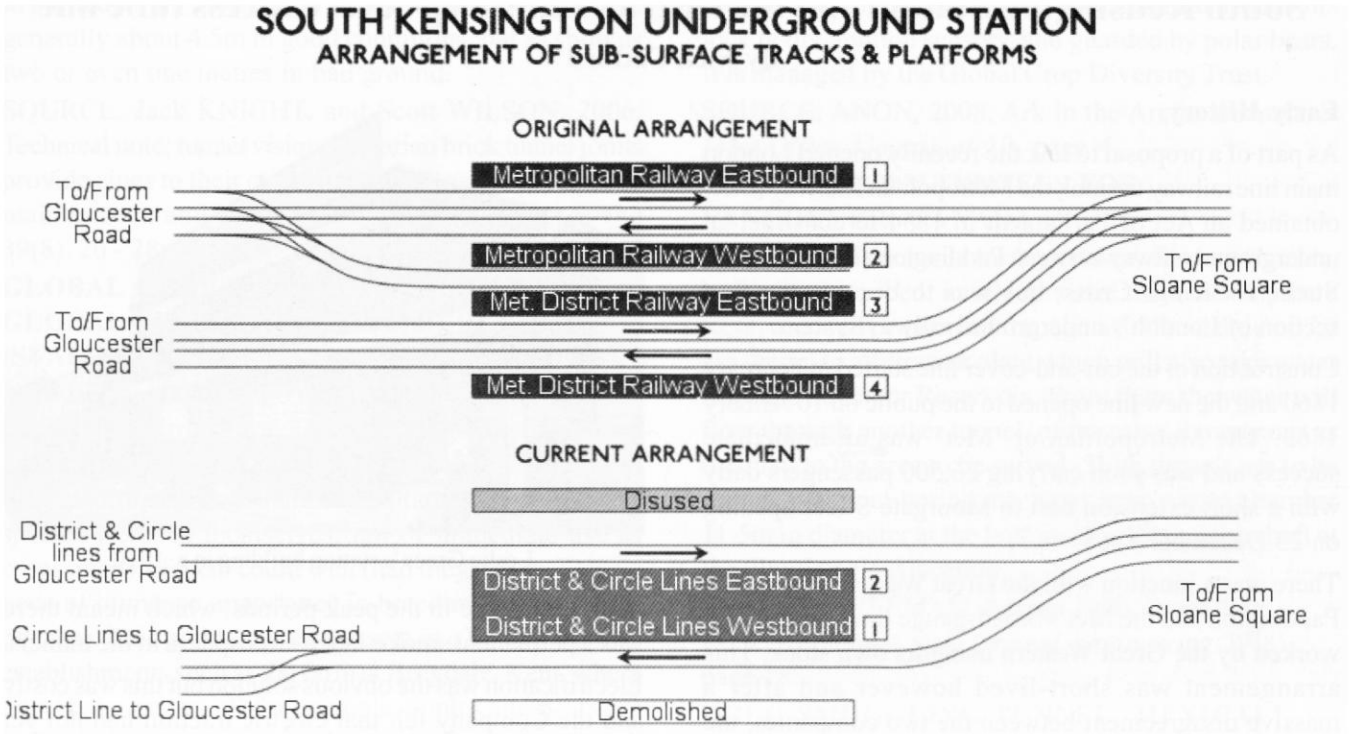
Leslie Green's station building in c. 1910

Electrification was the obvious solution but this was costly and the Company felt that electric traction had not yet proved itself under such a heavy load. To relieve the congestion, the MDR planned an electrified express deep-level tube line from Earl's Court to Mansion House. The scheme was announced in 1896 with the new line diverging from existing tracks east of Earl's Court station from where it would descend on a 1 in 42 gradient towards Gloucester Road running in a pair of 12' 6" diameter tubes beneath the existing Metropolitan District line to a terminus 71 feet below Mansion House station. The express line would have one intermediate station at Charing Cross, 63 feet below the existing station with hydraulic lifts connecting to the booking hall.

The MDR was still steam-hauled at this time which would have meant a change of locomotive at Earl's Court causing delays. To alleviate this, it was proposed that the change from steam to electric traction should take place in the first 176 yards of the Cromwell Road covered way while the carriages were held by a rack-railway brake. Parliamentary approval was obtained on 6 August 1897 but little work was done although the tunnel between Earls Court and South Kensington was eventually built as part of the Great Northern, Piccadilly and Brompton Railway.

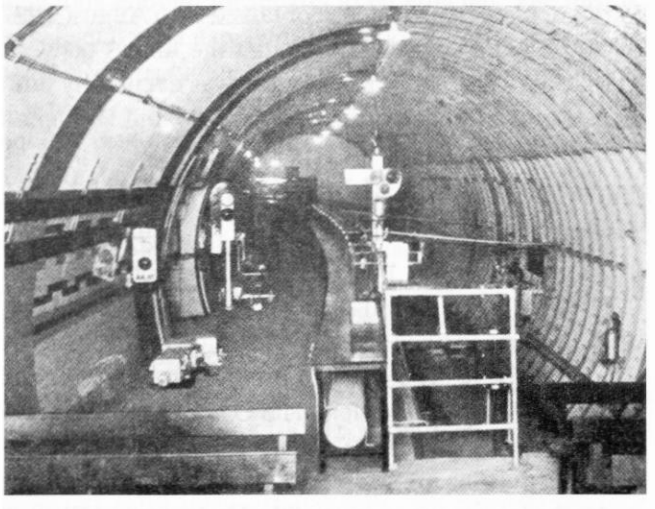
The Great Northern, Piccadilly and Brompton Railway (Piccadilly Line)

The Great Northern, Piccadilly and Brompton Railway (GNP&BR) was established in 1902 through a merger of two older companies, the Brompton and Piccadilly Circus Railway (B&PCR) and the Great Northern and Strand Railway (GN&SR). The GNP&BR proposed a deep-level tube line from South Kensington to Piccadilly Circus. In 1902 the MDR and the GNP & BR came under the joint management of the Underground Electric Railways Company of London Ltd, the planned tube line



was subsequently merged with a third proposed route and opened on 15 December 1906, as the Great Northern, Piccadilly and Brompton Railway (now the Piccadilly Line) between Finsbury Park and Hammersmith with the station at South Kensington opening on 8 January 1907.

The deep platforms at South Kensington were constructed beneath the sub-surface platforms and access was provided from street level by lifts from an extension to the station building. This new extension was designed by Leslie Green and built with the GNP&BR's distinctive ox-blood red glazed terracotta tiled façade. South Kensington was unique as all the other GNP&BR stations were built with both platforms at the same level; at South Kensington the eastbound platform was above the westbound platform which meant that the lifts had two lower landings. Lifts first stopped at the eastbound landing before descending a further eighteen feet to the westbound landing. The reason for this unusual layout was because the deep level station was planned as a junction between the GNP&BR and the MDR tube lines with the eastbound platform serving both lines but with two separate platforms and tunnels for westbound trains and a junction to the west of the station. A larger diameter tunnel can still be seen from westbound Piccadilly Line trains at the site of the junction. On the eastbound line, the larger diameter platform tunnel continues beyond the current platform with sufficient room for the District Line to branch off to the right had it been built.



Signal School

A section of the westbound Metropolitan District station tunnel was built at the same time and under the same powers as the GNP&BR platforms and its walls were even tiled. As this section of tunnel is adjacent to the lift shafts it seems likely that the work was carried out at this time to avoid later disruption or damage to the lift shafts if and when the deep level MDR line was ever built; a short section of tiled subway leading from the lifts was also built. The wide junction tunnels mentioned above were also built at the same time as the GNP&BR to avoid later disruption to services.

The deep-level line was never built as eventual electrification and resignalling of the MDR increased the line's capacity and the proposed deep-level express line was no longer required. The powers for its construction were relinquished in the MDR's 1908 Act although there were some later suggestions that the line should still be built.

In 1909, the Underground Electric Railway Company of London announced a parliamentary bill for the formal merger of the Baker Street & Waterloo Railway, the Charing Cross Euston & Hampstead Railway and the GNP&BR into a single company, the London Electric Railway Company. This bill received Royal Assent and was enacted on 26 July 1910 as the London Electric Railway Amalgamation Act, 1910. On 1 January 1913, the UERL purchased the City & South London Railway and the Central London Railway, thereby bringing all but three of London's underground lines at that time into common ownership under the Underground Group brand.

Later uses for the District Line deep-level platform

The abandoned partially-built MDR platform tunnel found a number of later uses. During World War I it was used for the safe storage of treasures from the Victoria & Albert Museum and china from Buckingham Palace. In about 1927 it housed a signal school with some track being laid including a set of points, a train stop and examples of various different signals for staff training. At this time a section of the tunnel was also converted into a lecture theatre with seating for 60 with desks, blackboard, projector and screen.

LPTB Emergency Headquarters

At the outbreak of World War II, the signal school closed and the tunnel was used as an emergency headquarters for the London Passenger Transport Board's engineering services and it was divided into two levels to increase the available space. It also housed equipment for detecting bombs with delayed action fuses that had been dropped into the Thames. Hydrophones in the river bed transmitted signals back to South Kensington. This information was used to determine when to close the floodgates that had been installed at the under-river crossings on the underground railway network.

Post-war changes at South Kensington

Back on the surface, the reversing track between the two island platforms was taken out of use in 1957 and the gap filled forming one wide island. The two side platforms (Platforms 1 and 4) were taken out of use in January 1968 and March 1969 respectively. The tracks for these platforms were also removed and platform 4 was subsequently demolished.

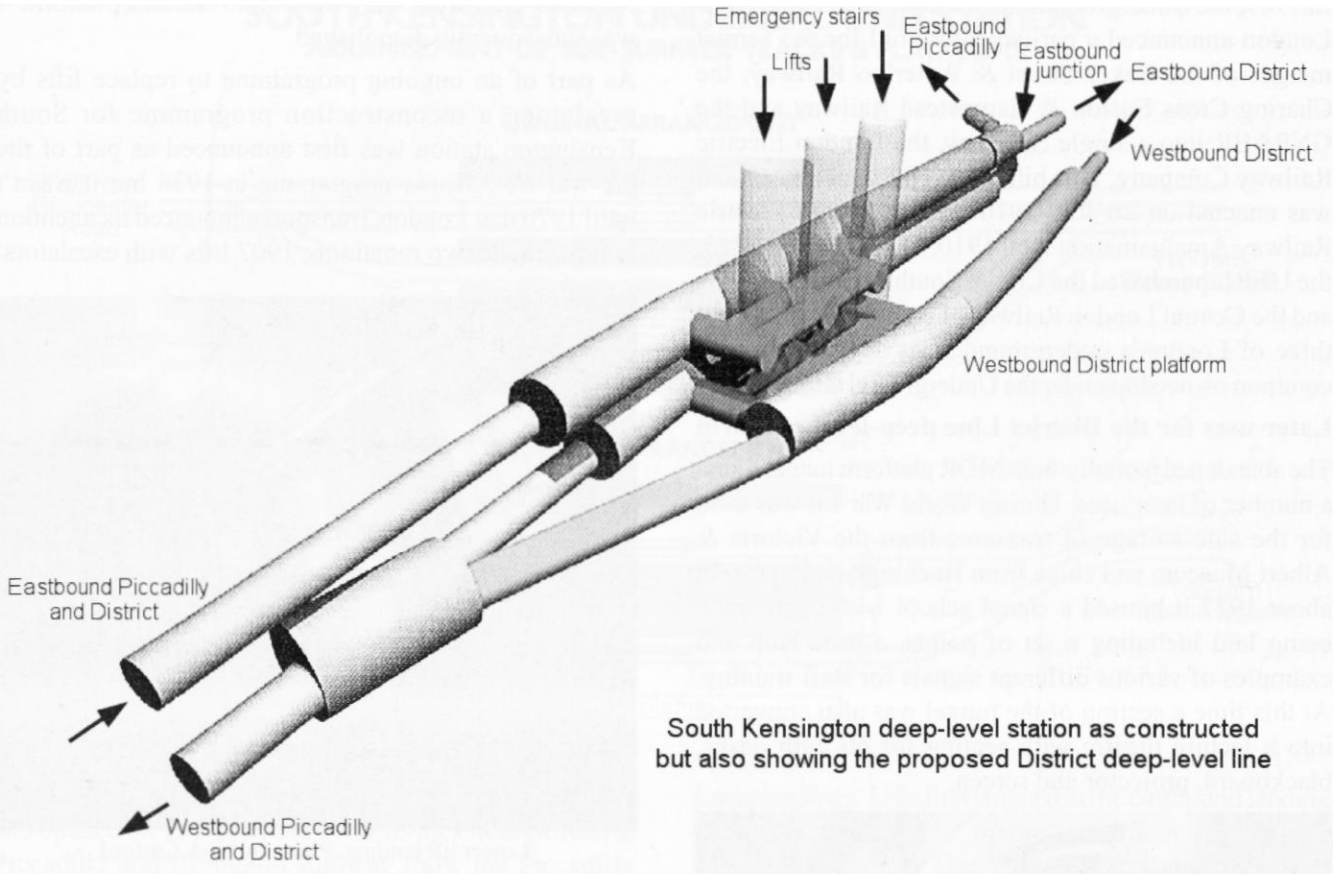
As part of an ongoing programme to replace lifts by escalators, a reconstruction programme for South Kensington station was first announced as part of the pre-war *New Works* programme in 1936 but it wasn't until 1970 that London Transport announced its intention to replace the two remaining 1907 lifts with escalators.

Lower lift landing. Photo by Nick Catford

In 1971 work on two new flights of escalators was started. The lower set of three (22.1ft vertical rise) which led up to an intermediate-level concourse was ready for use from 30 September 1973; the upper pair (34.5ft) from 20 January 1974. During the construction, the new lower escalator shaft intersected the deep-level MDR platform tunnel and the new westbound access subways were constructed in the space occupied by part of this tunnel. A short section at the east end of the tunnel survives and now carries cables although it is barely recognisable for what it once was.

An improved ticket hall serving both the Piccadilly and District Lines was operational from 21 October 1973 and the last two Piccadilly lifts were taken out of service and dismantled. The shaft for the emergency stairs was filled with a concrete plug top and bottom. Following the replacement of the original lifts with escalators, the GNP&BR station building on Pelham Street has not been used to provide access to the tube platforms and now houses station offices. One of the lift shafts is now used for forced-air ventilation with a fan being installed on the top while the adjacent shaft remains open. The remainder of the terrace of which it once formed a part has been demolished. It is possible that the entrance may be reinstated as a means by which the mobility impaired may access the tube platforms.

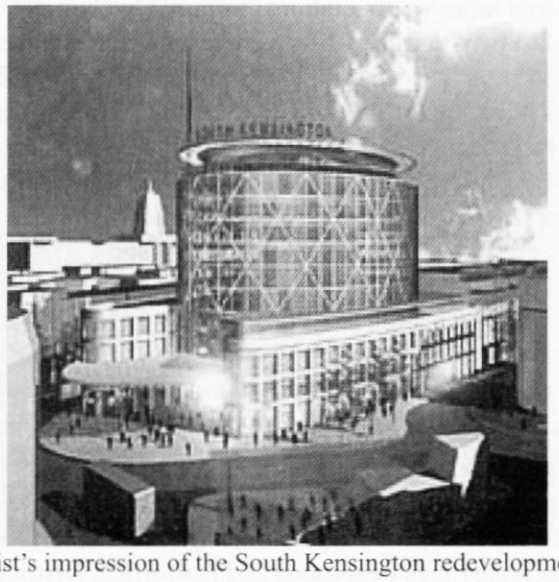
The present layout of the surface platforms at South Kensington is Platform 1 (formerly Platform 3): District and Circle Lines westbound and Platform 2: District and



South Kensington deep-level station as constructed but also showing the proposed District deep-level line

Circle Lines eastbound. There are points east of the station which allow westbound trains to terminate here and then crossover to the eastbound track. The main station entrance is located at the junction of Old Brompton Road (A3218), Thurloe Place, Harrington Road, Onslow Place and Pelham Street. The building, which incorporates a shopping arcade, is Grade II listed. Subsidiary entrances are located in Exhibition Road giving access by pedestrian tunnel to the Natural History, Science, and Victoria and Albert Museums.

Future redevelopment



Artist's impression of the South Kensington redevelopment

In 2003 Stanhope PLC put forward a proposal to redevelop the station. The proposal, which was supported by Transport for London (TfL), was for a mixed-use redevelopment which included a new station and public open space incorporating transport interchange facilities, retail outlets, residential living space and new office accommodation. A new entrance to the museum subway tunnel with new retail and visitor facilities at lower ground level was also proposed. The station would get a new ticket hall at street level with improved capacity for visitors and the local community, a large public orientation space providing a focus for South Kensington, an improved transport interchange co-locating the bus terminus, new escalator and lift access to all platforms, new fire escapes, fire-fighting lifts and staircases and efficient passenger-flow arrangements.

The new station would be made possible by the commercial development of the space above ground. To complement the station, there would be about 200,000 sq ft of office space housed in a glass building, a local food store and smaller retail units and 125 residential units. Despite approval from TfL, who would not have had to pay anything for the new station, there were considerable local objection. Although TfL are still keen to redevelop the site there is likely to be a more modest scheme with a report on a recently commissioned feasibility study due in April 2009.

Sub Brit visit to South Kensington

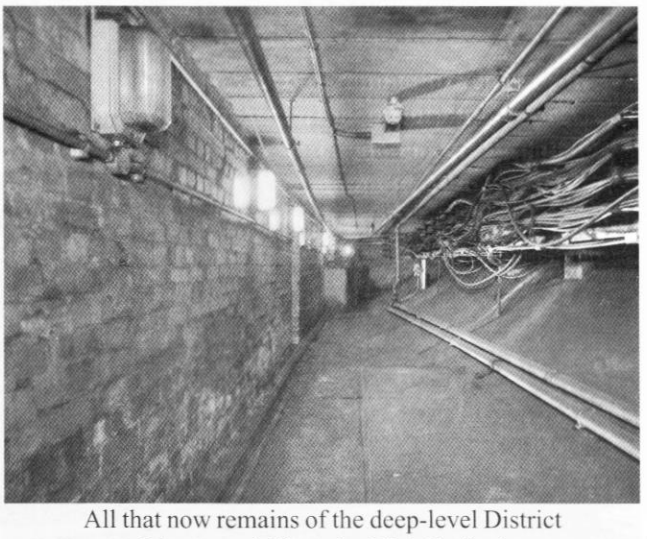
In December 2008, Sub Brit member Roger Cleaver arranged a visit to South Kensington, to see the remains of the deep-level District Line tunnel but also some of the other disused features of the station including both the upper and lower lift landings.

Lift Shaft - Note the lower lift landing at the bottom of shaft. Photo by Nick Catford

The visit was arranged for Sunday 11 January. As expected there was a lot of interest from members and Roger was able to arrange for two groups of sixteen members; there was still a long waiting list, such is the interest in disused underground stations.

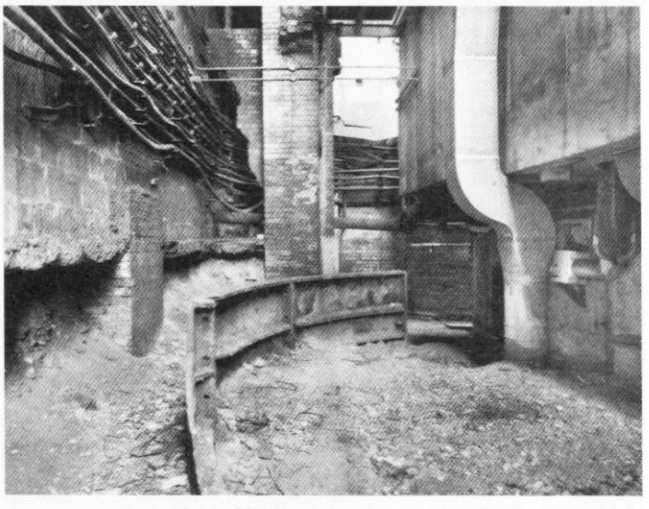
Our guide on the day was Chris Shew, Duty Station Manager of the Gloucester Road Group of stations. We met at the station supervisor's office on the District Line platform for a safety briefing. From here we could see the platform canopy still in place above the reversing platform which was removed in 1957. We then made our way to the now disused Pelham Street entrance and the upper lift landing which now houses staff mesroom and locker rooms. Both lift shafts are now used for ventilation with a fan mounted at the top of the intake shaft; the adjacent exhaust shaft is open with new safety rail and platform around two sides at the top to prevent accidents. We were able to look down the shaft to the lower lift landings below.

From the upper lift landing we descended a flight of stairs and out onto the District Line station concourse from where we went down to the site of the now demolished Metropolitan District westbound platform (No 4). At the west end of the platform site a number of circular steel shaft linings were protruding from the ground and Chris explained that this was the back filled emergency stairs shaft from the Piccadilly Line platforms below. This shaft was taken out of use when the escalators were brought into service in 1973. Because of its position it is assumed that this shaft surfaced on the now demolished Platform 4.



All that now remains of the deep-level District Line tunnel. Photo by Nick Catford

Next we saw the machine room for the upper escalators, then down to the lower machine room which cut through a large section of the deep-level District Line platform tunnel. At the west end of the machine room there is what appears to be a section of a horizontally divided circular tunnel, perhaps 40 feet in length and curving to the right at the far end. The tunnel is now also divided vertically by a brick wall and has some cables hanging on one side. We were told this was the only remaining part of the District Line platform tunnel. The position and diameter appears to be correct and there is no reason why such a tunnel would have been constructed during the installation of the escalators so the balance of probability is that this is part of the original District Line tunnel.



Top of the filled emergency stairs shaft. Photo by Nick Catford

Finally, we saw the two lower lift landings with a subway between the two lift shafts on each landing giving access to lifts on either side, each shaft having two lifts. The subways retain some white and blue tiling, the later colour scheme of the Piccadilly line. A number of cinema and other posters survive on the tiled walls dating from the 1960s and 1970s. The upper landing was entered through a louvred door on the platform. The lift shaft on the right

The disused Piccadilly Line entrance in Pelham Street.

angles; this was probably built to provide access to the District line deep-level platform and is now divided into two 'rooms'. The first room is painted orange and contains a sink and water heater and has in the past been used as a permanent way messroom although it now appears unused. From this room a door leads into another room with the tiles now painted cream; this room contains modern electrical racks. Finally we looked at a short subway that led to the emergency stairs; the shaft has now been filled and although the tiled entrance is still there the way on is blocked by a concrete plug. From here we returned to the surface to meet up with the second party who were patiently (!) waiting for us to return, our tour having taken nearly an hour longer than expected.

is now an intake ventilation shaft with a fan mounted at the top of it. The second lift entrance at the far end of the landing could be entered through a cylindrical drum of brickwork with a small door and a curved movable metal vane to direct the air flow into/out of the shaft. Passing the lifts another door led to a circular ventilation tunnel of perhaps 150 yards leading to a ventilation shaft up from the westbound Piccadilly Line; we could see the rails through a grating in the floor. It was obvious the 'fluffers' hadn't been here for many a year and the whole tunnel was deep with dust.

On the bottom lower landing, a door at the end of the subway leads to another section of tiled subway at right

Sources:

Abandoned Stations on London's Underground by JE Connor published 2008 by Connor & Butler

London's Lost Tube Schemes by Antony Badsey-Ellis published 2005 by Capital Transport

Rails Through The Clay by Alan A Jackson & Desmond Croome published 1962 by George Allen & Unwin

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Farrells web site (Terry Farrell and Partners - Architects)

From the Archives
The Limestone Mines at Dudley and Walsall in 1895

The South Staffordshire Mining Inspection District, in 1894, included parts of Staffordshire and Worcestershire, along with Essex, Norfolk, and Suffolk. The only reported East Anglian mine operating that year was the flint mine at Brandon, Suffolk. The remaining six mines in the District which came under the Metalliferous Mines Regulation Acts of 1872 and 1875 were in Silurian limestone in and around Dudley and Walsall in the Black Country.

The seven mines together employed five males aged 12 to 16, and 164 males over 16, underground. Above ground there were three males aged between 13 and 18 at work, and 68 older than 18. During the year 82,352 tons of limestone were raised (in the Black Country), and 73 tons of chalk and 115 tons of flints (at Brandon.)

There were three notifiable accidents, all in the limestone mines, reported in the following terms …

In the Hatherton limestone mine, Walsall, a boy of 15 years of age retreated so slowly when the word was given to "Fire", that he had his arm broken by a piece of projected rock. Fortunately for him, the three succeeding shots missed him.

A stone-getter in the Wrens Nest mine near Dudley, was injured on 18 September by a fall of rock from a height of 30 feet.

The other injury was only trifling.

Scott's report for the previous year had commented that 'The trade of limestone mining has felt the pinch of hard times, for the output was reduced.'

Reference

W. Beattie Scott, 1896, *Report of H.M. Inspector of Mines for the South Staffordshire (No. 11) District ... for 1895.* HMSO [C. - 8074] 22pp [pages 18 - 19]

Bunkers, Snow & Guns – Sweden January 2009

Bob Lawson

Friday 15 January 2009 – *an anonymous man leans back in his chair in a darkened room containing a desk and one telephone. The wrinkled brow suggests surprise and concern; the file on his desk with the title 'Subterranea Britannica' falls open at the proposed schedule for another Swedish visit. This must be it, he thinks, Sweden in deepest winter, who in their right minds are tourists at -8°C to look at our military defences? He picks up the telephone. "Send our best agent, we must find out more or it could be all over."*

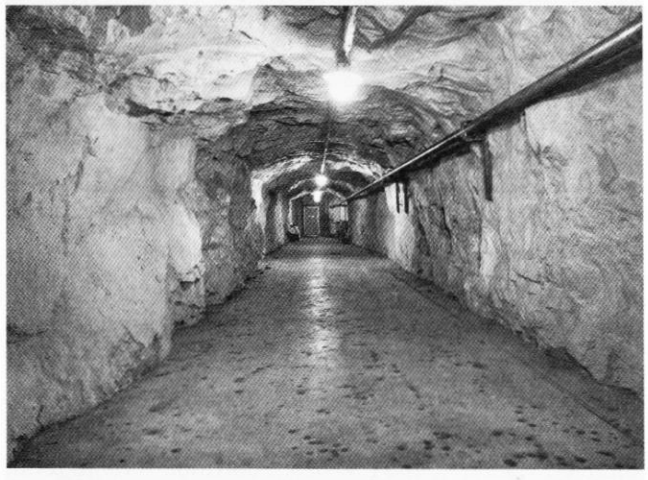
Report: Day One – 0930hrs Saturday

As soon as the targets left the Ryanair plane we had them on camera; they easily blended in with the au pairs, drug smugglers and illegal immigrants. We could not get a good picture of two of the party so we held their queue up at passport control. The party had arrived at Vasteras airport near Stockholm. We were successful in getting them to hire only two cars instead of three; our watchers will now be able to comply with the operational expenses cutback memo, although they did seem a little crushed in the back seat of their Volvos. Interestingly they have flown into one of our imposing regional airports and they only had eyes for the old military storage facilities on their drive out towards Uppsala. We had great difficulty following them without laughing too much as they spent much time on the wrong side of the road and it was a joy to behold at roundabouts.

Pre-WWII gun emplacement, part of Stockholm's perimeter defences. Note the pintle mount for a heavy calibre quick fire (QF) gun at the end of the emplacement.

Soon they stopped at a service station for food and drink — it was here that they picked up their local fixer who had travelled separately by train and taxis from Nychoping. All of them squeezed into the transport and continued on their way. Next stop was to see part of the Stockholm perimeter defences built just before WW1 about 1905 -1908 which consisted of a line of small forts, featuring construction for the first time in concrete, for the new breech loading, quick fire, heavy guns and new bolt action rifles for our brave soldiers. These forts are made in a T shape at 20 x 20 metres long with side doors every seven metres, chimneys every three metres and with an internal pintle mount at each end on which a heavy calibre quick fire (QF) gun would have been placed to command the line from attack if it had come to war with our old enemies. The site had been MoD property into the 1950s and the fort is in excellent condition. Discussion drifted to the ironwork around the roof of the bunker. This unusual feature could not be allocated to any particular use. It was possibly some kind of rainwater collection or disposal system or more likely part of a later added camouflage wiring system over the roof.

They then went to a different part of the defences to view the artillery support line. The site included concrete shelters between the five gun positions for the gun crews with accommodation and possibly some ammunition storage although smaller calibre mobile artillery of this time would keep their ammunition in their accompanying horse-drawn limbers. A larger concrete shelter at the end of the line would probably been used as a field command centre, a favourite of donkeys and officers.

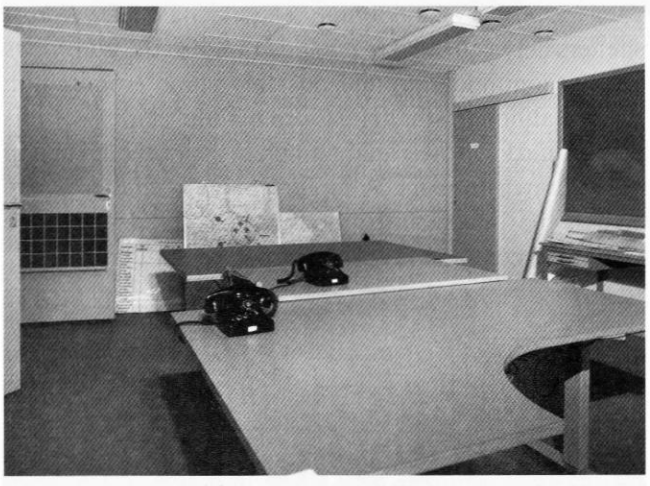


Entrance tunnel into the Uppsala Civil Defence control centre.

They then went to see a local community civil defence command bunker for the Uppsala area which had been operational by 1968. This bunker was of the usual Swedish design for the period of hard rock tunnels in which was used insulated prefabricated concrete sections and block construction, built inside a granite cavern. This produces a bunker currently with only 55 percent humidity (dry) inside which is easily kept warm and cosy for its occupants. The dome-shaped pre-cast concrete roof beams on the main two-storey construction had the usual steadying beams spanning from the rock wall to the eaves to help stabilise the structure when under violent attack. The metre gap between inner concrete walls and hard rock gives an air gradient insulation layer effect and allows any water to be drained away from

around the edge of the structure. The 40mm clean ballast rock on the floor was covering plastic drainpipes. The bunker had not been upgraded as much as one Sub-Brit had visited on a previous visit and contained a more 1960s feel. The Cold War utility of purpose was still evident.

The bunker entrance into the hard rock went on for about 15 metres and then through a pressure choke before splitting left to the generator room blast door or right by blast door into the main bunker through the decontamination shower room followed by a gas-tight steel door. The over-pressure choke feature was simple and substantial in concrete and was estimated by one of the party as potentially halving the effect of over pressure blast from any direct hit on the entrance by conventional weapons. This advanced and quite rare feature dominated the entrance and caused much digital recording. Obviously a direct hit by nuclear weapons would produce



Control room in the Uppsala Civil Defence control centre. Nuclear burst symbols are seen on the local area map leaning against the wall.

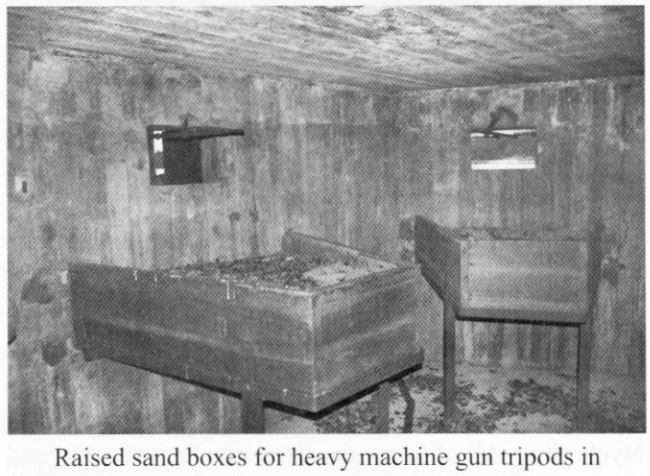
toast. Opening the 8mm thick metal gas door held by double connected side levers and passing into the main bunker area, a communications room was on the right. To the left a generously proportioned L-shaped concrete staircase lead up to the first-floor corridor. A radio room with no apparent emf subsidiary protection and various store and utility rooms led to the dormitories which, surprisingly for Sweden in the 1960s, were split into segregated male and female accommodation of triple steel bunks with floral printed curtains. Bathrooms were attached with an extra mirror for the female section. Upstairs the kitchen and refectory area had dining tables and chairs with seating for 36 persons and a social area containing two leather armchairs, two large leather sofas and copies of Ikea catalogues. Separate storage and office bedrooms filled up the rest of the upstairs area. The new owner, a local businessman, had let them in and was obviously surprised at the enthusiastic Brits wanting to record everything about his new purchase which is intended to be used for a secure computer server farm. They wished him good luck.

We watched the party at the end of the day retire to their hotel in Uppsala on the edge of the old airfield. The rare complete DC3 Dakota aircraft adjacent to the hotel car park, sitting on its dispersal area, just did not excite the party at all.

Observation of the party on Saturday night in Sweden at -6°C was going to be difficult but then our plan swung into action. With no food and initially no beer available at the hotel, hearts fell, so they were like putty in the hands of our local agent's suggestion. They all dutifully walked into the centre of town to the prepared venue, where the party arrived to find our table for ten waiting. Nobody noticed the coincidence in the packed restaurant. Unfortunately nothing of use was obtained except confirmation that our Swedish food was good and our beer even better. So we gave in and when they got back to the hotel about 2200hrs the bar was opened.

Report: Day Two – 0830hrs Sunday

Our local agent reported an excellent breakfast was taken by all and one party member bought some gloves at the local petrol station. He was still talking about them when one hour's drive later they arrived at Simpnas where they were joined by more locals, friends of the fixer. They had arrived at the edge of the archipelago of islands to the northeast of Stockholm, most of them being in a nature reserve with exceptionally beautiful vistas and environments (trees, water, fish, birds, the usual). The 40-krona single ferry arrived co-ordinated with the local bendy bus (no. 676 from Stockholm to Norrtalje then no. 636 to Simpnas) on time (the party commented that this sort of thing would never happen back home), then they sailed across to the island of Arholma. The weather was warming up to 0°C with sea conditions 2-3, with only a slight swell. The accommodation at Archip Lodge had sent a quad bike pulling a trailer to carry any luggage. This was loaded and they waved goodbye to the direct route to their accommodation.



Raised sand boxes for heavy machine gun tripods in an isolated pillbox on Arholma island.

The fixer kindly offered to show some large machine gun pill boxes secreted on the far side of the island which would take about sixty minutes Lars time. Initially the party was in good spirits passing through a bicycle

graveyard but then two hundred minutes later, the party had only seen one excellently preserved large concrete pillbox which still had all its original woodwork and steel work attached and lost two others. The internal four wooden raised sand boxes for heavy machine gun tripods were a rare and exciting find. A central observation cupola was another unusual feature inspected by the party.

Then it started to snow. Not heavily at first but persistent fine whiteness. It was then they must have suspected they were being followed; after following several winding paths through the trees, they unexpectedly doubled back to cover their tracks, then again and again.

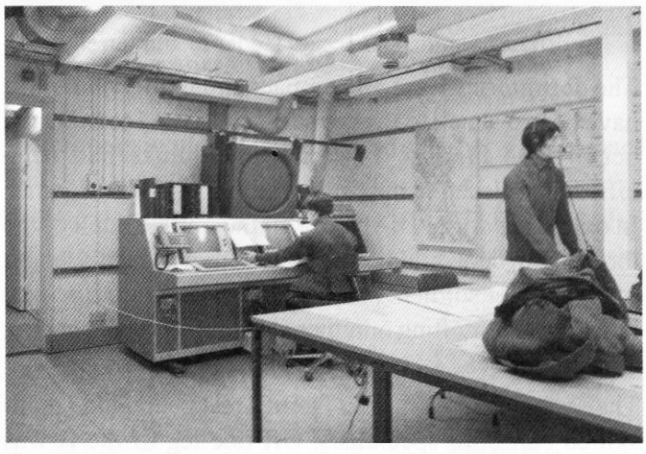
The main Bofors 105mm QF gun for the site. It was one of a pair controlled by the site command centre. The other one had been on an adjacent island and has now been removed. Each gun had support from two 40mm Bofor QF radar controlled anti-aircraft guns Mod. 40/70, 300 rounds per minute, each with a gun crew of 4 men. The gun was taken out of use c.1998.

The party finally arrived at Arholma Nord, Archip Lodge and site of the coastal battery at Arholma Norra. They were visiting a cold war strategically important site. Strategically the first lines of defence, from attack by our enemies, were submarines and air force planes. Lines of sea mines would have been laid out in times of increased tension, then as a final asset these coastal guns would come into their own if not destroyed by a pre-emptive strike of nuclear missiles or attack by Soviet Spetnaz troops.

The party were greeted on arrival by the local guide for the next part of the mission. A good English-speaker wearing a Swedish army combat jacket and field cap. The snow and cold wind appeared not to worry one of the party who showed his manliness by just wearing a tee shirt while the rest of these wimps were layered, hatted, gloved and shivering. Up the hill and into the icy blast they all trooped. The coastal battery was well camouflaged with fibreglass skirts on the gun and colour co-ordinated paint. If viewed from out at sea it could easily have been overlooked hidden amongst the rocks and fir trees on top of its granite hill. The gun was one of six of this calibre built to defend the archipelago.

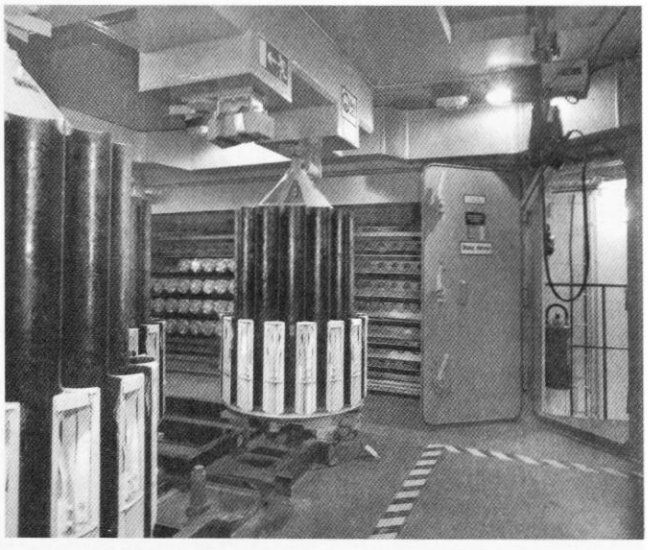
This 105mm automatic Bofors QF coastal gun commanded the approaches to one of four deep water passages between the islands. An attacking force would want to send Ro-Ro ships through towards Stockholm with tanks, men and equipment. A semi-automatic Bofors 40mm anti-aircraft battery was on the same hill and a similar one nearby to help with air defence. A 1960s analogue range finder and the later laser range finder from the 1980s scanned the fjord giving 270 degrees of pinpoint accuracy.

The party had spread out photographing everything and after much encouragement from their guide they descended to the warmth of the command bunker in the hill below the guns. The site commanded an excellent position and had been used as a site for three earlier guns which were removed when the command centre construction was started in the 1960s. The party went

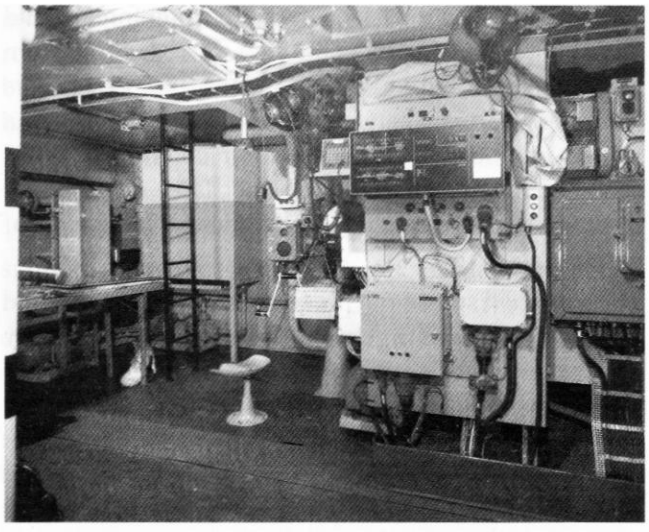


Part situation radar and communications for target co-ordination in command centre for control of facility and area guns.

into the entrance tunnel to find no over-pressure blast reduction provisions. The usual decontamination chamber had blast and gas doors. The lower floor was laid out in a large H shape. The kitchen was at the end of the short joining corridor of the H which had tables and chairs for the expected 150 - 200 men that would have to take meals from the bunker and surrounding facilities in time of full occupation. It would have been rather crowded.



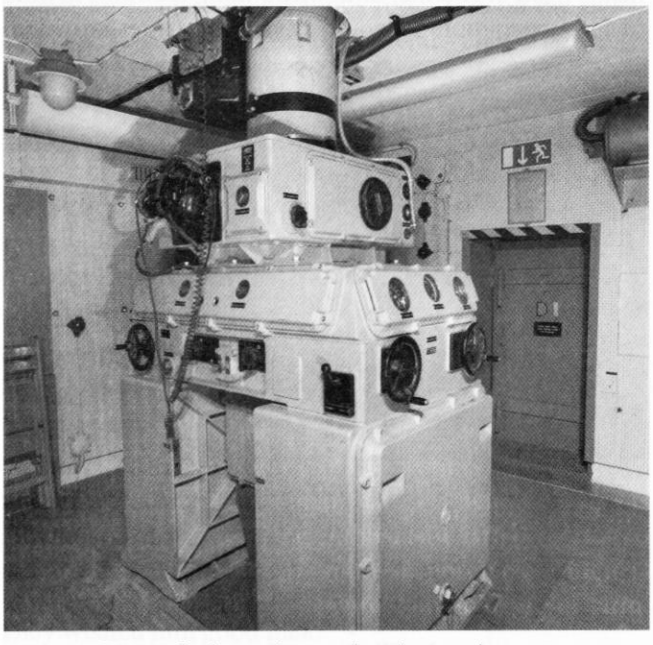
Main 105mm Gun, rotary magazine feed racks ready to be filled on trackway.



Main 105mm Gun, fire position, fire correction calculator, Gun officer's station and access ladder to gun turret.

The dormitories were all compact and homely but must have been a shock to the conscripts who had to train and occupy the facility. The three-tier bunks had been efficiently placed to maximise the amount of occupants. In one of the dorms, if you lay on the middle bunk of the three tiers you would be sleeping within an arm's length of eight other soldiers in a concrete box inside a granite hill. Cosy, comforting or rather claustrophobic depending on your outlook.

The standing force for the facility had been made up of skilled conscript specialists. Off one leg of the H was access to the gun and associated magazines and equipment. Going up to the third floor of the gun section the party was amazed to see the unique magazine arrangements that allowed this automatic gun to fire at the amazing rate, for such a big gun, of up to 35 rounds per minute. The 105mm cartridges would have their fuzes manually set and then they were placed in rotary feed racks containing 15 cartridges. These giant revolver magazines were quite special. They would have been charged with a selection of armour-piercing or high explosive rounds and later proximity fuzes were used for targeting small ships for near misses. With an effective maximum range of 25 km and optimum accuracy from 19 km they represent as good as it gets, even today for this calibre.



Range finder and target bearing equipment.

The fuzed shell, which flies to the target, travels to the gun chamber attached to its brass case via a conventional ship's cartridge lift. The rotary revolver magazines located at the foot of the lift use an auto indexing mechanism to feed the cartridges into the lift. An automatic disconnect allows the next magazine to be manually pushed into place and another fifteen rounds heads to the target, which by now is starting to worry. Once fired the empty cases are ejected into the outside world through a shield ejection port with fume extraction.

The magazine area which is directly below the gun is only protected by five metres of concrete. All could see the danger from a direct hit. The party made lots of cooing noises and one drooled all over a blueprint of the gun's automatic action. A splinter movement tried to access the range-finding equipment up a spiral staircase but were prevented and all were told to leave the bunker for refreshments. (Note: recommend guide for medal). After a conference with the management a second guide was found at extra cost that fed the party beer and then showed them the range finders and the additional emergency exit that had been added recently on instruction of our good friends the Swedish HSE to allow guided parties around the facility.

The allotted time soon expired and after being ejected from the bunker once more, like a herd of wildebeest that had lost their leader, they wandered about aimlessly, locating baggage and accommodation. The watering hole was visited and the evening meal was served at 1900 hrs. The meatballs, raw salmon, quiche, potato salad followed by strawberry cheesecake, assorted fruit slices and beer went down a treat after a hard day's bunkering. But the night was not over — a few of the party went to look for a moose seen fleetingly through the trees, stumbled into an infantry trench with its own small bunker and visited a nearby concrete tower. They did not find the moose. Discarding my Moose outfit, I started to write my report about 2330 hrs after they had all gone to bed. I am sorry but this is a copy of my report; the original one was destroyed as I had to use it as ear plugs from the sound of snoring.

Report: Day Three – 0630hrs Monday

Today was an early start with the temperature about 0°C, bags were heaped in the quad trailer and the party prepared for a long march down to the ferry. Payment of bar bills slowed up the departure as memories were slightly vague. The assembly area outside the meal hut resembled the start of a half-marathon run for slightly

unfit but enthusiastic participants. The signal was given and all roared off at a fast walk. The anticipated one-hour march down the direct track was achieved in 30 minutes and the party had plenty of time to appreciate the scenery and the cold weather. I heard conversation turned to trying to describe undesirable ethnic group characteristics to Swedish nationals with no concept of prejudice, very difficult. A different, larger ferry arrived, on time. My attempts to infiltrate the ferry with our Captain from yesterday were a complete success even without a disguise; nobody noticed it was the same man. At Simpnas they took a group photo and the remaining locals left.

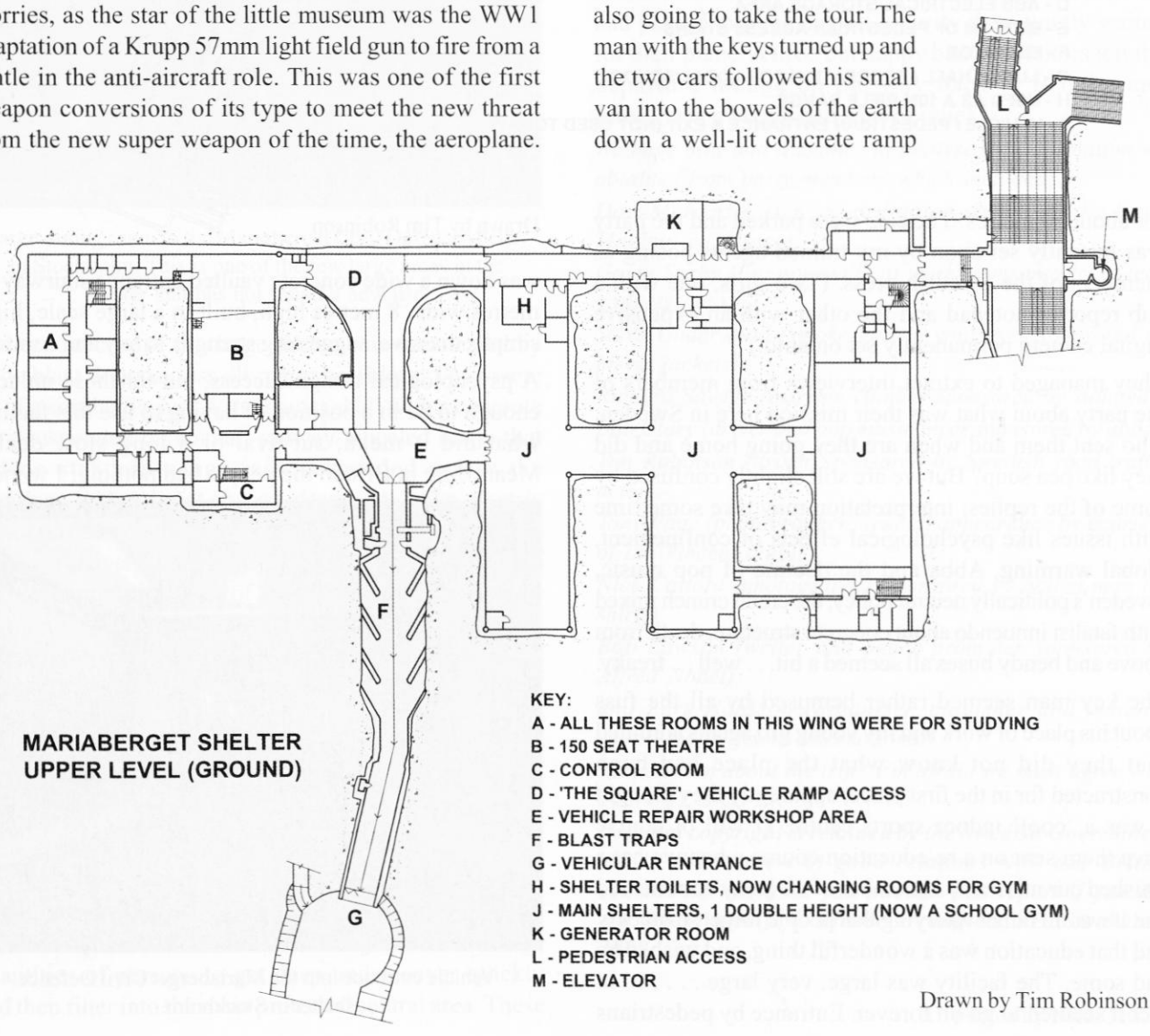
The party then headed in their national identity cars to view a public civil defence shelter near Stockholm from the 1950s which was designed to hold 3500 people. Something decidedly big then. On the way to the shelter the party stopped off to see a Bloodhound missile preserved as a memorial to the local battery, in excellent condition. The party had no trailers, so we still have our memorial.

At the other end of the old army camp, now an industrial estate, was a small museum. This was closed. But no worries, as the star of the little museum was the WW1 adaptation of a Krupp 57mm light field gun to fire from a pintle in the anti-aircraft role. This was one of the first weapon conversions of its type to meet the new threat from the new super weapon of the time, the aeroplane.

Main pedestrian entrance steps into the Mariaberget Civil Defence shelter in Stockholm

A unique exhibit which only a few of the party appreciated but truly inspirational for gunners.

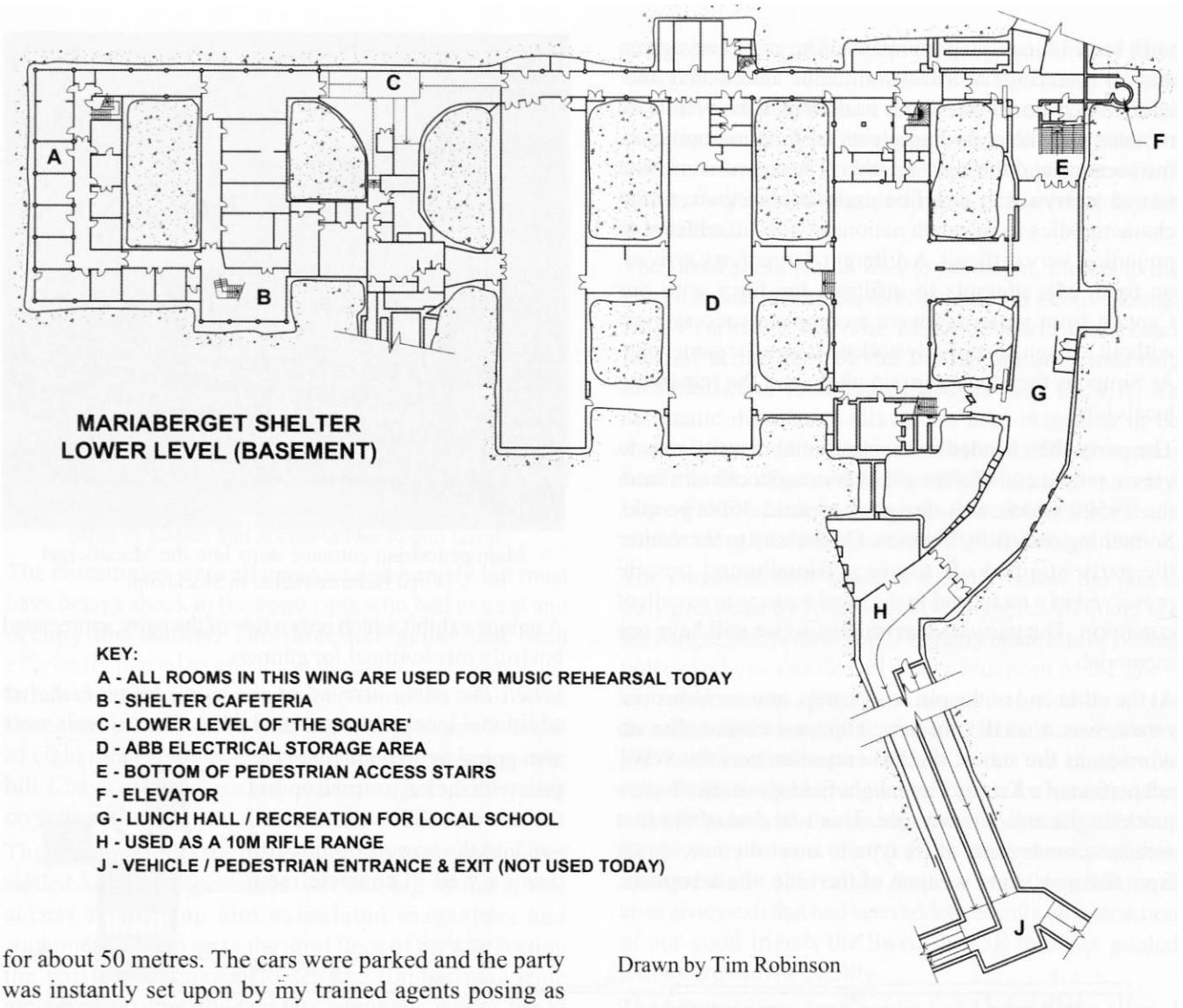
When the party arrived at the civil defence shelter additional local persons joined them. These locals were also going to take the tour. The man with the keys turned up and the two cars followed his small van into the bowels of the earth down a well-lit concrete ramp



MARIABERGET SHELTER
UPPER LEVEL (GROUND)

KEY:
A - ALL THESE ROOMS IN THIS WING WERE FOR STUDYING
B - 150 SEAT THEATRE
C - CONTROL ROOM
D - 'THE SQUARE' - VEHICLE RAMP ACCESS
E - VEHICLE REPAIR WORKSHOP AREA
F - BLAST TRAPS
G - VEHICULAR ENTRANCE
H - SHELTER TOILETS, NOW CHANGING ROOMS FOR GYM
J - MAIN SHELTERS, 1 DOUBLE HEIGHT (NOW A SCHOOL GYM)
K - GENERATOR ROOM
L - PEDESTRIAN ACCESS
M - ELEVATOR

Drawn by Tim Robinson



MARIABERGET SHELTER
LOWER LEVEL (BASEMENT)

KEY:
A - ALL ROOMS IN THIS WING ARE USED FOR MUSIC REHEARSAL TODAY
B - SHELTER CAFETERIA
C - LOWER LEVEL OF 'THE SQUARE'
D - ABB ELECTRICAL STORAGE AREA
E - BOTTOM OF PEDESTRIAN ACCESS STAIRS
F - ELEVATOR
G - LUNCH HALL / RECREATION FOR LOCAL SCHOOL
H - USED AS A 10M RIFLE RANGE
J - VEHICLE / PEDESTRIAN ENTRANCE & EXIT (NOT USED TODAY)

Drawn by Tim Robinson

for about 50 metres. The cars were parked and the party was instantly set upon by my trained agents posing as members of the Swedish press. (Two girls, one with a cub reporter notepad and the other with an expensive digital camera permanently set on auto.)

They managed to extract interviews from members of the party about what was their mission here in Sweden, who sent them and when are they going home and did they like pea soup? But we are still slightly confused by some of the replies; interpretation may take some time with issues like psychological effects of confinement, global warming, Abba and the decline of pop music, Sweden's politically neutral policy, the credit crunch mixed with fatalist innuendo about concrete structure, death from above and bendy buses all seemed a bit. . . well . . freaky.

The key man seemed rather bemused by all the fuss about his place of work and my young girl agents admitted that they did not know what the place had been constructed for in the first place; apparently they thought it was a 'cool' indoor sports centre. (I will of course have them sent on a re-education course when we have finished our mission.) A member of the party commented that it was all rather worrying that people forget so quickly and that education was a wonderful thing, and wished he had some. The facility was large, very large . . . . . in fact it seemed to go on forever. Entrance by pedestrians was down a wide concrete vaulted entrance stairway 12 metres wide, 8 metres high, built in a large scale, high, simple, massive, suggesting strength, safety and comfort.

A psychological design success, but for those unlucky enough to be in a position of having to use this facility, what did it mean, survival or a long slow death? Meanwhile in Britain the people had nothing; I wonder

Vehicle entrance into the Mariaberget Civil Defence shelter in Stockholm.

now who was the wisest. The vehicular access ramp had over-pressure blast protection designed into it with shaped concrete side pillars at oblique angles to help deflect and dissipate any blast that might rush down the slope. The party's expert opinion was that they would be next to useless. The gas filter drum units were still all in place and dated 1957. The generators had been three large Scania 11-litre engines although only one remained in place. Many of the dormitory rooms had been converted for use by indoor sports and martial arts like judo, karate, fencing, boxing, pistol shooting, ballroom dancing etc. The new use for this old warhorse was good to see although many original features were sure to go if conversion to a major sporting and social venue was continued.

Large dining room in the Mariaberget Civil Defence shelter in Stockholm. This is one of the few large areas in the shelter that has not found a new use.

The central core of this large shelter was surrounded by large blast doors across all major corridors. They were all of a similar design. A steel outer shell with a concrete core suspended on a small railway-wheeled bogie that ran on standard-gauge rails suspended across the openings with a lintel chassis design. A 7.5hp electric motor turned a continuous steel wire on a revolving drum that was driven though an integral gearbox. The slab doors' estimated weight of 30 to 35 tonnes effortlessly slid across with honking siren and flashing warning light on operation.

These 1950s doors still held their magic. The experience would encourage anyone to go mad and spend 500 krona, immediately. Cheers of the assembled crowd resembled a Hollywood film premiere, photographers pushing and shoving in a scrum to get the best pictures. Caught up in the emotion of the moment, my humble camera was even in focus. Surrounding the protected core of the site deep in the granite hill, the large entrance feed chambers curved around two sides. The design allowed large quantities of persons to get deep under cover quickly and then filter into the main protected central area. These chambers, in excess of 200 metres long, 6 metres high and 12 metres wide had a distinctive road tunnel shape as found in Swedish defence aircraft tunnel hangar designs from the 1930s.

No other countries are known to have built tunnels or hangars on this scale during WW2 except in Nazi Germany towards the end of the war where mountain factories were built for V-weapons. So the latest designs used here during the 1950s were cutting-edge at the time of construction. The later civil defence designs of the 1960s built on earlier experience are still hard-rock world leaders. The sheer size of this and other shelters with the provision of full facilities for so many ordinary people showed the world how to attempt to protect their populations from nuclear war, but at huge expense.

Soon it was time to say goodbye to the party I had got to know over the last three days. They had dropped the fixer off at the train station and then headed for the airport. The hire cars stopped for refuelling at a petrol station. The driver of one of the cars had some confusion about how the automatic fuel pumps worked. This was not helped by the other car passengers who rather cruelly found it amusing. Eventually all was well and after all had passed through airport security they quietly waited for their plane. A tired but happy band of visitors left the departure lounge on the way back to Britain, and Immigration breathed a sigh of relief.

We have now had a chance to analyse the information we obtained from party members which included:

Dan McKenzie (UK co-ordinator sponsored by ligne Maginot en Alsace),

Gavin Saxby (I'm not really at work sponsored by hi-tech gadgets inc.),

Steve Underwood (smoke gets in your eyes sponsored by hi-viz jackets),

Richard Savage (extreme climber sponsored by sudafed),

Bob Clary (driver and pop music lover sponsored by abba),

Tim Robinson (driver sponsored by Swedish road traffic acts),

Tony Page (photographer; special appearance by courtesy of the Vincent club),

Nick Catford (photographer sponsored by action man tee shirts)

Bob Lawson (writer and peace promoter sponsored by Alfred Nobel)

and Lars Hansson (organiser, publisher and twitcher sponsored by fixers international)

Conclusion about the trip? I'm afraid we must agree with TP: "IT'S OVER".

All photos by Nick Catford

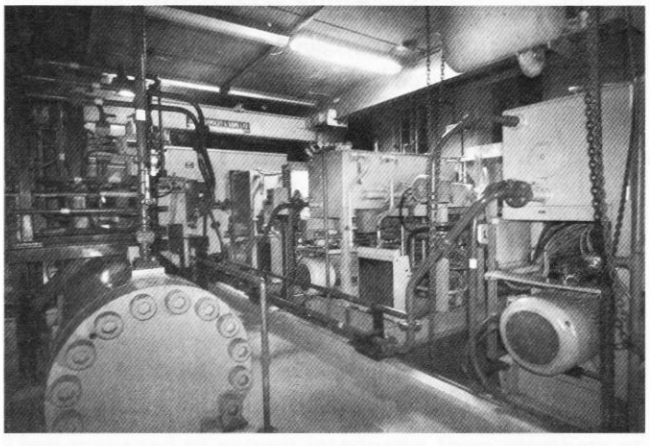
Visit to the Thames Barrier, Eastmoor Street, London SE7

Roger Morgan

14 and 21 January 2009

This extremely successful and popular trip saw an unprecedented 111 people (over ten percent of members) shown over the above- and below-water portions of the Barrier in three trips of two parties each. I went with the second group on 14 January.

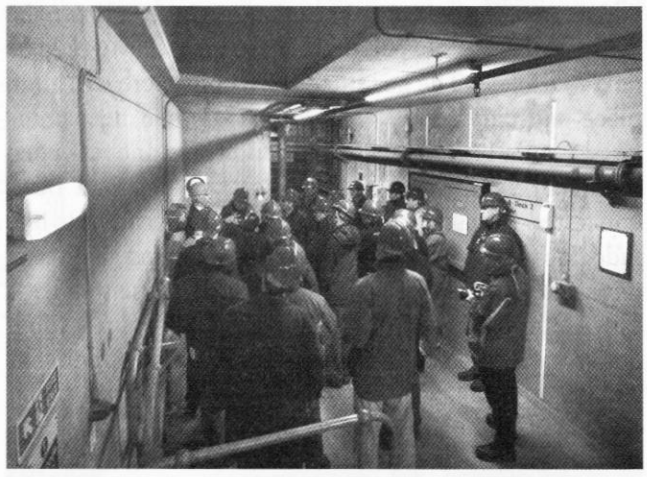
The day was bright and not too cold. I drove, but SubBrit members were able to spot their own kind on the train out of London Bridge and introduce themselves. Arriving in good time I made my way to the Barrier Information Centre, only to find it closed! Climbing the flood wall earth bank however soon revealed that on the upper storey was a thankfully open cafe, with a lot of familiar (and not so familiar) faces queuing up for a leisurely lunch, having just finished the morning trip. More and more of the second party found their way to the cafe, desperate for a quick breakfast before their trip — thus unfortunately the two parties had mutually different objectives, but it was good to overlap.



Pier 9 - the first pier northwards from the south abutment, smaller than the deepwater piers because of operating the lighter shallow water gates. On the right the power-packs supplying the pressurised hydraulic fluid, on the left a hydraulic ram cylinder to operate one of the shallow gates.

Breakfast over, about forty of us assembled a short walk away at the security gate of the Barrier Control Tower, a curious piece of architecture rather along the lines of an airport control tower. Badged up, we were guided to a lecture theatre and Roger Vine our guide introduced a fifteen-minute orientation film on the Barrier and Thames Flood Defences, and then answered questions (eg: there was a 150mm gap between the gate and the sill, narrower at the entry and exit so debris which got into the gap would not be able to jam the gate; the gates were hollow and filled with or drained water as they moved). We were then split into two parties, provided with helmets, and began the visit to the Barrier itself.

I quote from my article in Subterranea Britannica *Bulletin* No 25 (February 1989) pp 11-12:



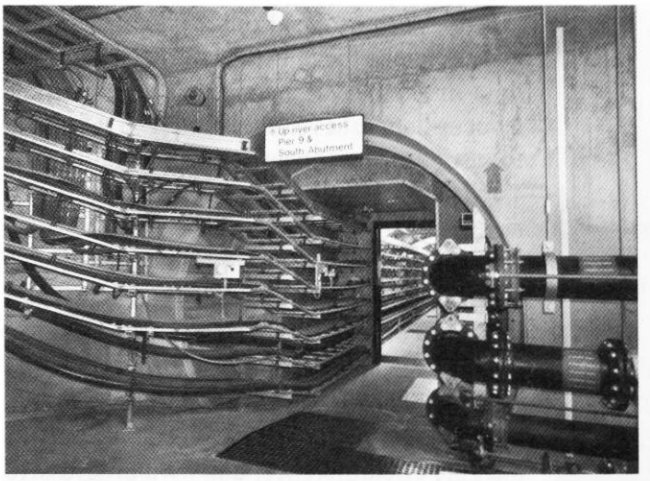
The party in the tunnel level of Pier 9 – the downriver tunnel extends to the left behind the stub wall in the distance.

"Two New Thames Tunnels

When the Brunels, father and son, drove the first-ever subaqueous tunnel beneath the Thames in 1825-43, the project was beyond the leading edge of current expertise and became an icon of Victorian technological endeavour against impossible odds. The river broke through the roof and completely flooded the tunnel five times; work was abandoned for seven years with the shield bricked up behind a mirror and the half-completed tunnel open as a tourist attraction ('The Great Bore'). At least 12 men were killed and many more died from cholera caught from the constant rain of river water; the total cost was £486,249; and Sir Mark Isambard Brunel's health was irreparably damaged.

But its fame was stupendous; twice as many people visited it in August 1851 than the Great Exhibition, and a Miss Julia Pardoe, visiting Constantinople, was closely questioned on it by Mustafa Reshid Pasha."

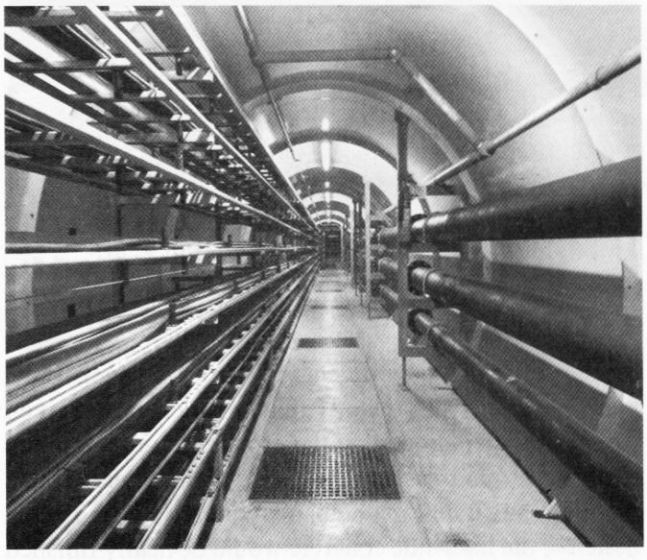
The huge spiral descent ramps were never constructed, and so this herculean project lingered as a seedy footway cum funfair connecting Rotherhithe and Wapping until bought by the East London Railway in 1864, never having



Pier 8 – The entrance to the tunnel to Pier 9.
The metal trunking forming a rectangular doorway is protecting the rubber concertina gaiter of the underwater joint between the sill and the pier, and contains an annular ring of sprinklers bathing the gaiter.

paid a dividend to its backers. With this dreadful precedent subaqueous tunnelling was abandoned as beyond contemporary techniques for 43 years until Barlow/ Greathead's shield-driven segmental cast-iron Tower Subway set the pattern for all subsequent London Clay tube tunnels.

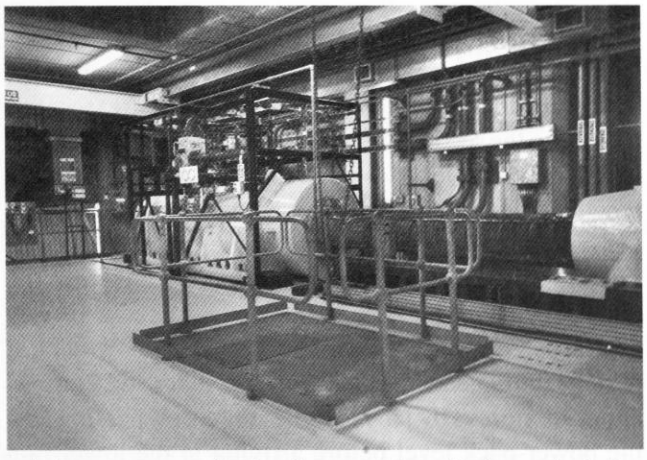
The GLC Thames Barrier, constructed 131 years later between 1974 and 1982 seven miles downstream from Brunel's tunnel, was its true successor. One of the largest and most difficult civil engineering projects in Britain, it is the world's second largest movable flood barrier and took 4,000 persons eight years to construct at a cost of £500,000,000 — only the Channel Tunnel surpasses it. A little known feature of its construction are a further two sub-Thames tunnels, bringing the saga of the Thames Tunnel full circle.



A typical view within a tunnel looking south – welded steel tube embedded in the precast concrete sill, power and comms cables to left; sprinkler, fire hydrant and water mains to right. The end of the tunnel in Pier 9 in the distance.

The Barrier consists of ten movable steel gates spanning a third of a mile across the tidal Thames at Silvertown. The four largest gates, each 61 metres wide, span the navigable channel. They are sectors of cylinders which can be rotated about a horizontal axis, so that they either lie flat on the river bed in a concrete sill, or rise to form a vertical wall against the tide. Designed in 1970 to resist all but a thousand-year tide it was hoped the barrier should cope with fifty years of rising average tide levels, but unforeseen global warming is progressively increasing the number of closings. Based on current estimates the barrier will be able to cope with projected sea level rises until around 2060–2070. Since 1982 (up to 2007) the barrier has needed to be raised over 100 times.

The gates are rotated from either end by a pair of hydraulic rams rocking a massive crank. This machinery is housed in nine piers each thirteen storeys high with foundations fifteen metres into the chalk, built within deep water coffer dams. They are linked under water by pre-constructed cellular concrete sills which were floated to the site and flooded to sink them into position.

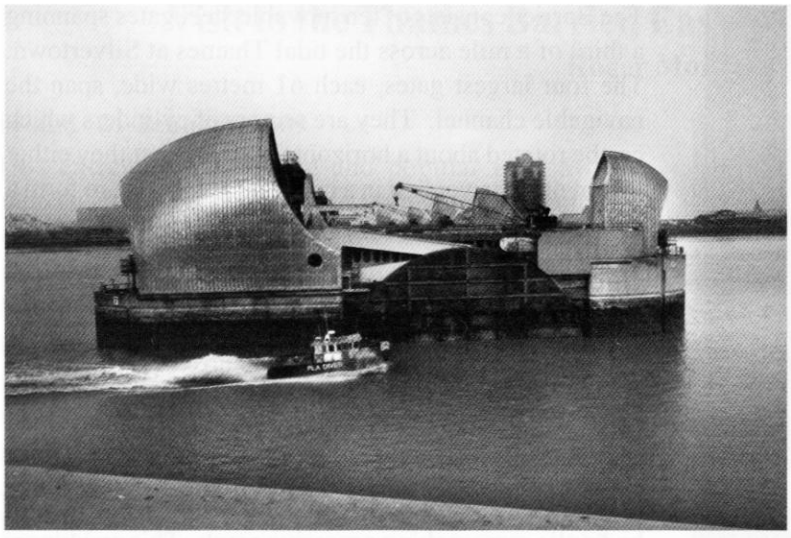


A deep water gate hydraulic ram – the cylinder on the left, the extended piston protected by rubber concertina gaiter in the centre, the sliding actuating boss on the right.

All the piers and their machine rooms evidently have to be connected by power and control cables and to allow human access, and by an absolutely fail-safe method, considering that the barrier will be operated for real in virtually disaster conditions. The solution was to incorporate two completely independent and unconnected tunnels in the concrete sills, each carrying a duplicated cable network. Each tunnel therefore connects both banks, allowing any part of the barrier to be reached, under any conditions, from either end and by two separate routes.

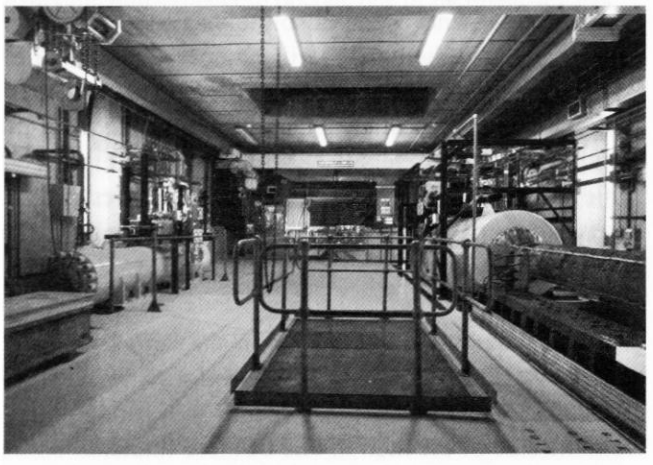
My schematic section, compiled from the various publicity handouts available from the Barrier Information Centre, gives an idea of the stupendous scale of the undertaking from the size of the man in one of these tunnels.

The Control Tower is on the south bank of the Thames. The river is of course shallower near the banks, so the two nearest gates were smaller and not so deep as in the



Pier 7 from Pier 8 looking north with the deep water gate fully open. The main rams are housed on two levels in the upriver nacelle on the left, the ratcheter ram is housed in the down river nacelle on the right. The actuating arms are in yellow – the main arm rocks about the black pivot and is horizontal, the ratchet is horizontal and withdrawn. The architectural groove in the concrete marks the level of the highest normal tide.

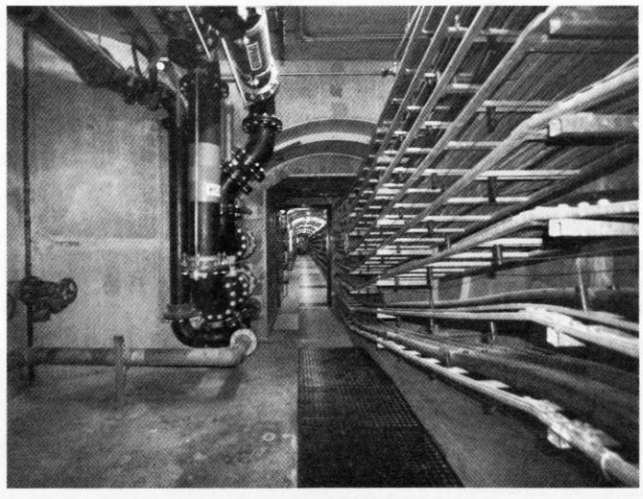
shipping channel. Access to the first pier was via a bridge (though there was one tunnel). We then descended the interior of the pier by concrete and steel staircases, and crossed to the second pier via our first sub-aqueous tunnel at the shallow level. Coloured spots on the floor denoted whether it was the upstream or downstream tunnel. In the base of the second pier, we again descended to the deeper shipping channel level, and entered the downstream tunnel system proper, which stretched away in an apparently infinite vanishing perspective. We walked past the third pier and on to the fourth, where we climbed about six storeys by labyrinthine staircases, passing first the power-pack level before arriving at the lower ram level and open deck. All the machinery was a cheerful primrose yellow, and the hydraulic rams were incredibly large and impressive – perhaps seven metres long by three in diameter.



One of the ram floors in Pier 8 looking upstream – on the right a deep water gate ram set, on the left a shallow water gate ram set.

Roger Vine whipped out a pad and marker and explained the rather Heath-Robinson-but-on-a-massive-scale mechanism, drawing the lever system in several colours with the pad in front of him from behind and the top! Upper and lower horizontal hydraulic rams in the upstream nacelle push-pull a rocking arm which is linked to the gate – this can rotate the gate about 110 degrees, from horizontal to just past vertical. For maintenance the gate needs to be turned further, clear of the water, so there is a smaller horizontal ram in the downstream nacelle which can clip onto a series of pegs in the gate circumference, and by a progressive latching and unlatching regime can ratchet the gate through top-dead-centre so the main mechanism (working in reverse) can rotate the gate to fully horizontal in the raised position. Should the main mechanism fail this secondary system could also operate the gate, on its own – though much more slowly. Surprisingly, the gates were only rotated from one end (being sufficiently stiff not to twist), which gave an instant fifty percent safety factor.

Unfortunately, on my visit, no machinery was active, but I understand the 21 January trip coincided with a maintenance rotation, and the group had all this demonstrated to them.



Typical view from a pier into the full length of a tunnel – comms cables, mains, joint protection, disappearing apparently to infinity!

We surveyed the magnificent view from the deck of the pier, but it was surprisingly much colder in mid-river. Roger Vine explained that the prominent groove in the concrete around each pier was an architectural foible marking the highest mathematical tide, so that the green lichen of the inter-tide concrete would be neatly finished off. We waved to the other party on the third pier, then it was back the way we had come, up and down the endless staircases. And Oh dear – what was that hairline crack in the pristine concrete of one of the pier's basements,

with a nasty damp patch? 'How thick is the concrete?' someone asked – I think the answer was six metres – nothing's perfect!

It being a SubBrit occasion, I found the exact technique for building the sub-aqueous tunnels the most interesting information. They were welded steel tubes some three metres in diameter cast into the cellular concrete pre-cast sill, and sealed with waterproof bulkheads either end. The corresponding hole in the pier was also sealed with a waterproof bulkhead. The sill was floated to vertically above its position and then flooded so that it sank onto hydraulic ram support points, which were used to level and position it to the required accuracy and then the hydraulic fluid was replaced by a binary epoxy mixture which set solid inside the rams locking them in position.

A diver entered the water-filled space at the level of the tunnel between the pier and sill bulkheads (via an air lock in the pier bulkhead?) and bolted an annular rubber gasket the diameter of the tunnel to the pier and the sill, filling the gap between them. The water-filled space was then pumped dry and the two bulkheads removed, opening the tunnel to the pier. The rubber gasket was then double-bolted for extra security, and cased in behind an annular steel trunking about a metre long, forming a series of doorways along the tunnel.

All in all an excellent visit enjoyed by a large proportion of SubBrit members and guests – thanks are due to Martin and Linda Dixon for organising it and hosting the first day, and to M C Black for hosting the second day.

As an aside, a scan of the Thames Flood Drill instructions (found in "Lost Lands and Sunken Cities" by Nigel Pennick, *Fortean Tomes*, 1987) might be of interest to some members:

'What these calm pictures don't convey, of course, is that the weather is likely to be frightful - storm force winds and horizontal torrential rain, not to mention lightning and thunder - trees will be across roads and railways, power will be out, and there will be huge waves on the Thames.'

Think the Michael Fish 'hurricane'. That is why the Barrier has to be self contained, extra sturdy, simple and fail safe.

Those who attended on the second day were quickly ushered out after the indoor presentation. The engineers at the barrier were testing one of the gates and the group was invited to watch from one of the piers. They saw the barrier move up and turn through 90 degrees to its horizontal position in mid-air. This enabled them to see, at close quarters, how the ratchet mechanism forces the barrier over top-dead-centre so that the hydraulic rams could continue their work in the opposite direction. All very interesting and enjoyable if a bit cold!

All in all an excellent visit enjoyed by many Sub Brit members and guests – thanks are due to Linda Bartlett and Martin Dixon for organising it and hosting the first day, and to M C Black for hosting the second day. We are also grateful to Roger Vine and Jan, our guides at the barrier, and to Lynne Bridge of the EA who co-ordinated our visit. Trips are not offered to the general public but as the trip was so popular we will look at trying to schedule another visit in the not too distant future.

John Nicholls' search for metals in Middlesex, Hertfordshire, Buckinghamshire and Kent

The following item based on an Elizabethan manuscript now in the British Library may be of some interest.

> Sir, - In the Lansdowne MSS. (57, fol. 146) in the British Museum may be seen a copy of a licence granted in December, 1588, by Queen Elizabeth, to one John Nicholls, for a term of six months, to dig for "mynes or mineralls of golde, silver, tynne, or leade, hidden within the earth, in the counties of Middlesex, Hertford, Buckingham, and Kent."
>
> What success may have attended his searches in the other counties I know not; but as I searched in vain for any notice to the effect of a renewal of the grant so far as concerns Hertfordshire, it is more than probable that Master John Nicholls did not find any "myning" a very profitable occupation in that county. Can any of your readers throw light upon the subject?

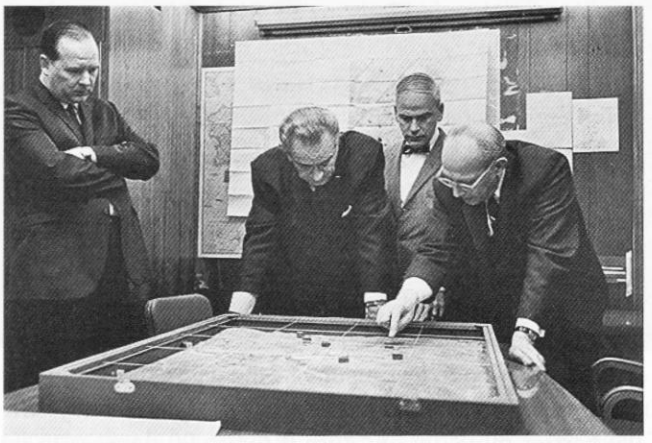
Doubtless Mr. Nicholls found no metalliferous ores in the Home Counties, although 'fool's gold' (iron pyrites or iron II disulphide) undoubtedly occurs! But did he dig any holes? And, if he did, how did he decide where to dig them, and *what* did he find?

SOURCE: FOSSOR, 1884, Mining in the Home Counties. *The Antiquarian Magazine & Bibliographer* 6, 94 – 95.

We have a situation, Mr President . . .

Julian Allason

Julian Allason visits the White House's underground Situation Room.

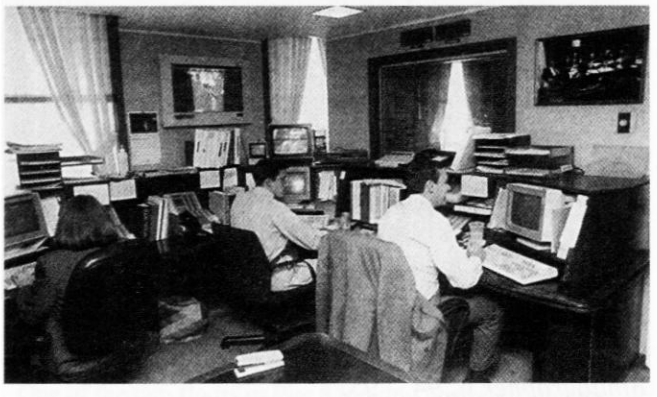


LBJ in the Situation Room

"It is not a proper bunker, you know," explained my escort as we descended the steps past the White House mess, used by the small number of officials who work in the West Wing. "If a bomb drops we would be toast like everyone else inside the beltway".

Although I had lunched in the White House's staff mess before, this visit had been preceded by an anxious 36 hours wondering if my clearance would be upgraded for a visit to what remains the most secure part of the building, the Situation Room. Finally the call came and I made my way back to the southwest gate of the White House complex, presented my ID and was escorted in. At the bottom of the stairs is a locked door, a Marine guard and two well-built men in black suits.

Although it looks historic from the outside the White House interior was rebuilt after World War 2 within a stout steel frame, and new foundations poured. But no ten-storey deep refuge was constructed, as has often been reported. Just the Situation Room in the lower basement, beneath the Chief of Staff's office. It comprises a little less than five thousand square feet of open space, and some small, but important rooms. Dr Henry Kissinger described the atmosphere as, "oppressive".



Temporary situation room 1966, used during the construction of the new underground room

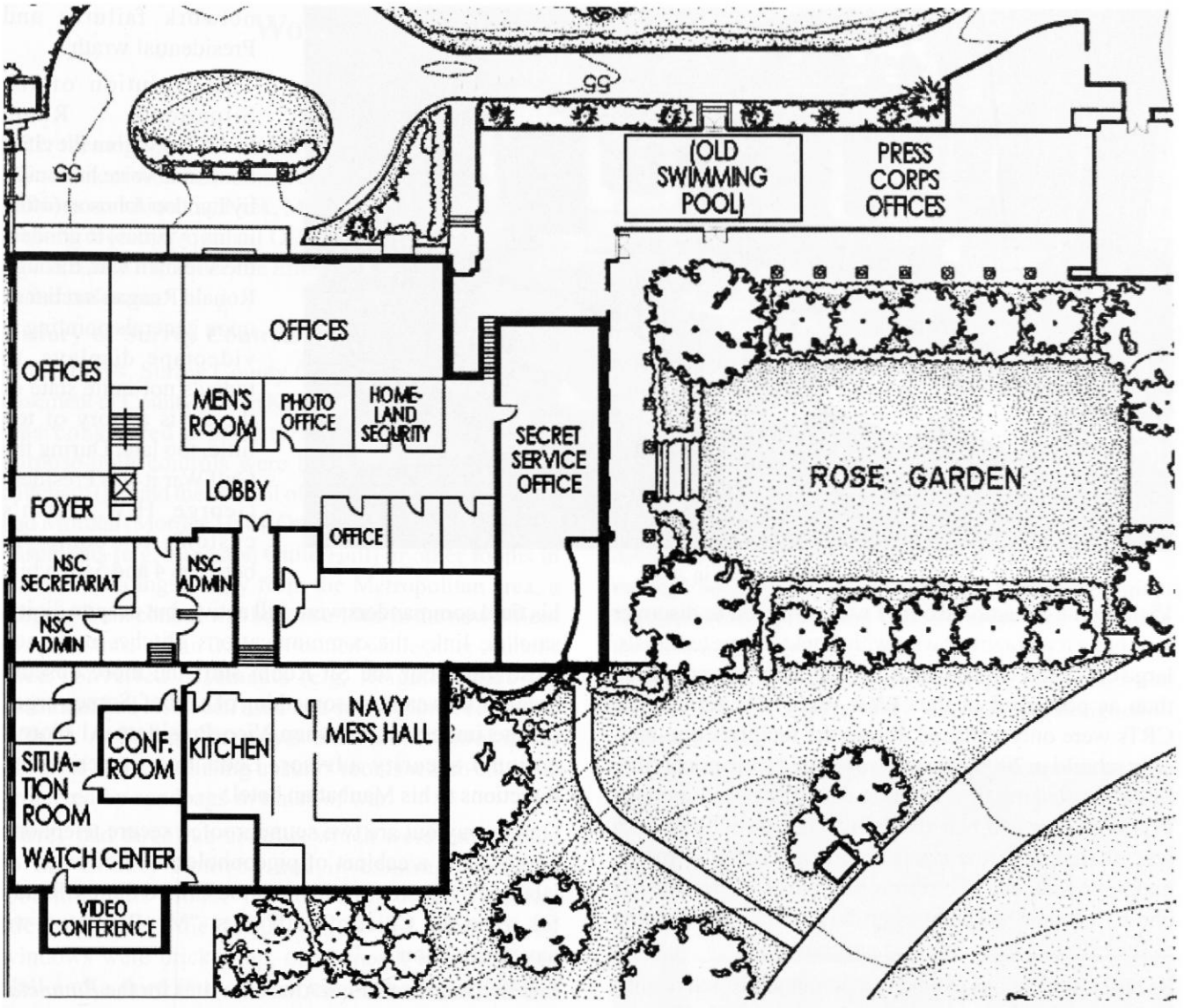
The day of my visit is quiet, and after surrendering my cellphone for deposit in a lead-lined cabinet, I am admitted into a large, featureless and almost deserted room. Desks face the wall with most of the 24" networked screens blank but for a flashing Microsoft logo in one corner. Use of the Sit Room was at that point confined to officers of the National Security Council, and outside of emergencies employed for secure conferences and to prepare early morning summaries of international newspapers.

Within the L-shaped open office is the President's videoconference room, a surprisingly small space enclosing a table with just enough room for three to sit along each side, and the President's chair at one end. Facing him at the other end is a bank of four screens, one running CNN, another a link to the Joint Chief's conference suite at the Pentagon, a third depicting a live feed from a video on a tank, the last displaying satellite imagery overlaid with the power grid of the foreign city in question.

Ronald Reagan being briefed during the attack on Libya in 1986

Since my visit the Videoconference Room has been re-equipped with a wide, high definition plasma screen on which multiple images can be displayed and overwritten using Telestrator sketching technology. Two smaller flat screens have also been inset into each of the panelled side walls so that during larger conferences officials crammed into extra seats can have an unobstructed view of the proceedings. A warning light illuminates when proceedings are being recorded.

The refurbished room was christened in May 2007 when Tony Blair participated in a video conference on Iraq, his entourage bringing the occupancy up to sixteen. At this point the air-conditioning was struggling, and Blair had to squeeze in beside President Bush, "Practically in his lap as usual," as one observer remarked.



Although the White House had long used the Map Room for presidential briefings and conferences, it was the lack of real time information during the failed 1961 Bay of Pigs invasion of Cuba that triggered the creation of a Situation Room with secure communications links to the Pentagon, State Department and CIA. Until the second Clinton administration it was used only in periods of heightened tension or when special video facilities were required.

Today its Watch Center is manned round the clock by a rota of thirty officers and technicians primarily drawn from the intelligence community and military, sometimes supplemented by specialists with regional knowledge and languages. They are organised into five watch teams comprising three duty officers, a technician and an intelligence analyst.

Their day begins with the Watch Team's preparation of the Morning Book for the President, Vice President, and most senior White House staff. This contains a copy of the National Intelligence Daily, the State Department's Morning Summary, and diplomatic cables and intelligence reports. The Morning Book has to be ready in time to be placed in the car collecting National Security Adviser for work. The Watch Teams also produce mid-morning and evening summaries targeted at issues of current sensitivity. What they do not do is undertake intelligence analysis. Their job is to boil information down to its essential elements for senior White House and NSC officials to digest. The Sit Room's last function is to arrange the President's phone calls to foreign leaders in conjunction with the White House Communications Agency, employing interpreters with stratospheric security clearances.

Access to the Sit Room – known internally as "the Woodshed" - has now been widened to include the Homeland Security Council and the office of the White House Chief-of-Staff. Its continuously updated assessments to White House staffers are intended to be more specific and event-related than the daily briefing to the President - often given in person - by the Director of Central Intelligence.

Watch Centre in 2006

Visiting the Situation Room I was surprised to discover how basic its equipment was, with clunky phone terminals, large CRTs and white boards, all distinctly less advanced than as portrayed in the 'West Wing' TV series. The CRTs were only replaced during the facility's one-and-only rebuild in 2006, when it was gutted and optical fibre links installed in a new modular ducting system intended to provide plug-and-play flexibility. The cost of fibre optics was shared with the press room upstairs, the media making a financial contribution. A fair deal, perhaps, as one TV channel had highjacked the Situation Room name as the title of a daily briefing programme.

Security precautions extend to a permanently active anti-bugging technology and a system, set into the ceiling, to detect and jam cellphone and other transmissions. Even President Obama's encrypted Blackberry does not work down there.

Today Watch officers sit at workstations tiered theatre style. Three further teleconference rooms, one known as the Surge Room for short notice crisis meetings, and a kitchen have been provided. As well as enabling an overdue secure wide channel link to Air Force One's Videoconference room the upgrade has contributed a welcome degree of reliability to a system hitherto prone to network failures and Presidential wrath.

The evolution of the Situation Room technology from the chart boxes and voice links used by Lyndon Johnson (often in his pyjamas) to conduct the Vietnam war, through Ronald Reagan's reliance upon generals pointing at videotape displays, to today's not-quite state of the art is a story of too little, too late. During the Gulf War it was President George H.W. Bush's custom to come in between 4 and 5am while his field commanders were still active, but despite digital satellite links the communications glitches remained frustrating. For the Sit Room staff the more obscure requests thus came as something of a relief. Some verged on the imbecilic, as when Vice President Al Gore's national security advisor, Leon Fuerth demanded directions to his Manhattan hotel.

On the way out are two soundproofed secure telephone booths. And a cabinet of pigeonholes, one of which is labelled POTUS - President of the United States. Ready for when the Chief-of-Staff says, "Mr. President, we have a situation . . ."

Sub Brit member Julian Allason writes for the *Financial Times*.

Blair and Bush in the Situation Room in 2006

Woking Borough Council Emergency Centre

Visit date: 17 March 2009

Edward Combes

After the original trip was disappointingly cancelled due to inclement weather some weeks beforehand, it was in glorious sunshine that Nick, Mark and I made our way to Woking Borough Council Offices in the centre of town on our return trip to see the Emergency Planning Bunker in the basement.

History of Surrey Controls

In the 1950s, Surrey County Control was located in the basement of County Hall in Kingston. Metropolitan Surrey was considered a priority target area and surface purpose-built controls were built between 1954-55 at Mitcham (behind the council offices), Epsom (Town Hall) and Morden (Morden Hall). Other boroughs used existing basements (e.g. Kingston Guild Hall) or other rooms in council buildings. Away from the Metropolitan area, a purpose-built control was built in c.1965 in the new offices of Addlestone Urban District Council while other councils used converted basements (e.g. Reigate where the basement had also been used as a sub-regional control in WWII). At Woking there was a District Control in the old civic offices utilising upstairs rooms which could be protected by sandbags in times of war.

Surrey had three sub-controls which were subordinate to the County Control; one in existing rooms in Coombelands House in Golf Club Road, Woking (demolished in the 1980s) where the lower storey windows were bricked up, one beneath Reigate Town Hall and a third in the basement of the Surrey Police Headquarters in Guildford.

In 1965 Metropolitan Surrey became part of the GLC. The Surrey County Control was relocated to a purpose built bunker beneath Guildford Technical College which was completed in 1968. Following the national stand-down of Civil Defence in 1968 only the new Surrey County Control was retained along with Reigate as County Standby on minimal maintenance; no other controls were maintained.

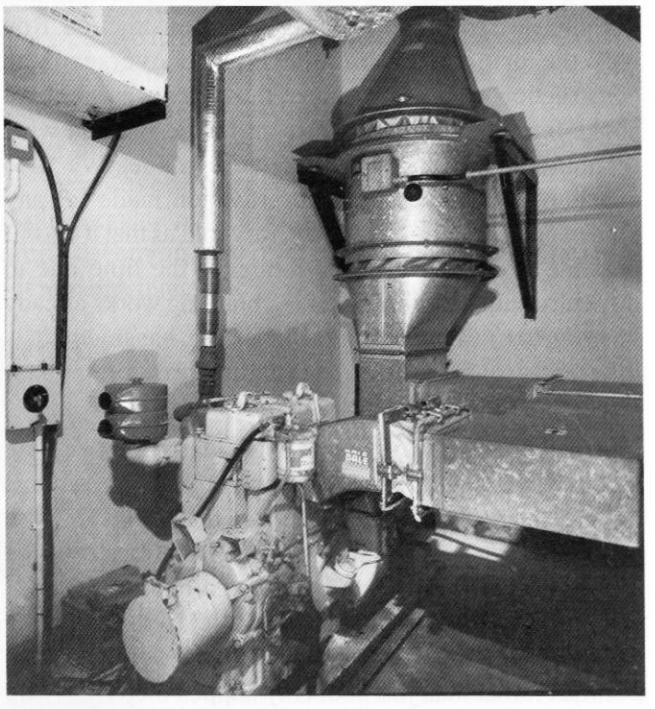
New bunkers

During the 1974 local government changes, a number of new local councils had been established. In 1984 all councils were required by the Home Office to construct protected bunkers from which they could organise civil protection and recovery following a nuclear strike by the then hostile Soviet Union. These were to be built to Home Office specifications with blast doors and air filtrations.

New controls were built at Mole Valley, Dorking (under the new Civic Centre built in c.1968), Reigate & Banstead (shared with County Standby in the existing Town Hall basement), Runnymede (old Addlestone UDC bunker), Spellthorne – Staines (new offices in c.1987), Guildford Borough (existing cellars under old offices), Waverley (existing basement of council offices in Godalming), Epsom (beneath new extension to Town Hall built in c.1990, the old Town Hall basement had been temporarily used from 1980), Surrey Heath – Camberley (beneath new council office built c.1990), Elmbridge (beneath new extension to Esher Civic Centre built c.1990) & Tandridge (beneath new office in Oxted built in c.1984). These new controls were generally now known as Emergency Centres.

Woking Emergency Centre

In Woking during the early 1980s new civic offices were already under construction in the town. The building was designed and built specifically to meet the needs of a modern borough council. To comply with government requirements, a protected control centre was located in the basement of the office building as part of the original building specifications and interestingly the bunker was built as a fallout shelter only and was not designed to withstand blast.



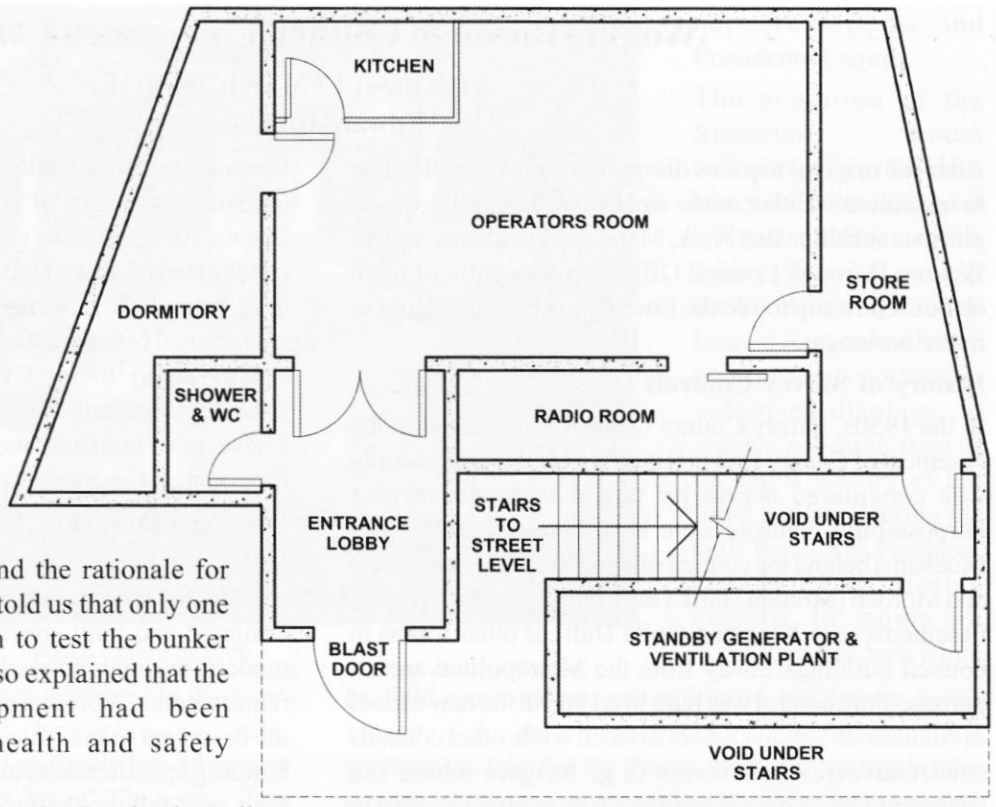
Ventilation plant and standby generator

Woking Borough Council received almost no funding from the Home Office to build this bunker as it was already part of their basement and was not a special construct. This was quite uncommon as most councils were awarded between 75-100% funding for bunker building. The bunker was built by Waites to plans designed by the council. The plans were influenced by bunker building in Switzerland which was regarded as some of the best in the world at the time. The bunker was, however, a

somewhat unusual shape and appears to have been fitted in where space was available.

The construction and design

We started the trip by being presented with visitors' badges and bizarrely going up two floors in a lift. Surely the bunker wasn't on the second floor? But no, we were shown into a meeting room by our host, Facilities Manager Bernie Firth. Bernie proceeded to tell us about the bunker, how it came about and the rationale for building it at the time; he also told us that only one exercise had been undertaken to test the bunker after its commissioning. He also explained that the showers and plant equipment had been decommissioned due to health and safety considerations.



Woking Borough Emergency Centre.
Plan drawn by Tim Robinson

After about ten minutes Roy Freeland arrived to talk to us about the design of the bunker and to answer any questions we had about the design and construction. Roy was the original architect who had overseen the construction and design almost thirty years earlier. We spoke for over half an hour about the design and what influenced the choices that were made. We also questioned why there was no provision made for any kind of emergency escape route. Roy told us that it wasn't possible to build an escape tunnel at the time due to difficulty with disturbing existing building works already in progress. As the bunker is in the basement it is inherently quite a strong structure providing extra protection for the occupants.

The bunker was always meant to be dual-purpose acting mainly as a storage area which would be made operational in the lead-up to nuclear war. Indeed the blast door has a plate on it saying 'furniture store'! No rations or other such supplies were to be kept in the bunker unless a state of emergency or war was declared. This was because it was believed that nuclear war would build to a climax rather than just suddenly happen thereby giving the planners time to stock the bunker. After this highly interesting and informative talk we then made our way down in a lift to the basement of the office block. This area has all the plant for the building as well as the bunker which had standalone plant and air filtration provided for it within the secure perimeter of the bunker walls.

Exploring the bunker

We exited the lift and headed to the left for about 5 metres when we were faced with standard outwards-opening double doors. We headed through these and we were facing the blast door. This was around ten centimetres thick (half the thickness of many local authority emergency centre blast doors) and was around one and a half metres wide. To the right of the blast door is a set of stairs which lead directly out onto the street; there is also a void formed by the staircase proceeding up further.

Proceeding through the blast door into the lobby area there was a shower and flushing toilet in a room to the left. The shower would have doubled up as a decontamination shower in times of emergency. The shower has now been decommissioned due to fears of Legionella bacteria growing in standing water pipes. In front of us was the operations room which was entered through a standard set of double office doors which opened towards us (there was no airlock as found in many other council bunkers). The operations room is about ten metres by about eight metres and is full of furniture and other items needing storage by the council. There is an original air vent in the ceiling. In front of us in the operations room was a small kitchenette which is equipped with a small Baby Belling oven, warming plates and a sink - the room being about two metres square!

To the left of the kitchenette is the dormitory, roughly triangular in shape and clearly designed to fit into the existing shape of the basement. There are eight metal framed bunk beds which now double up as shelves for additional storage. The bunker would have been staffed by around thirty people who would have operated a 'hot bed' system in the dormitory. The room is around two and a half metres wide at its widest point and about six metres long.

The unusually shaped dormitory where the bunks now double up at shelves

The Radio Room

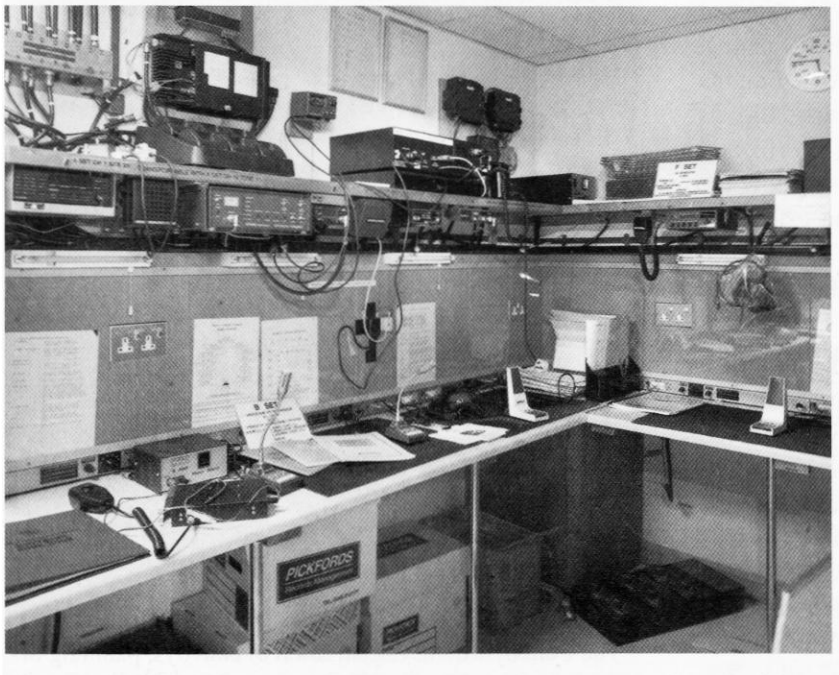
Exiting the dormitory and crossing the Ops room we entered the Radio Room through a sliding door. The room is around five metres long by two metres wide. This really was the gem of the visit as it still had all the original radio equipment inside it, all of which was still connected and in working order. Also present were many folders and documents that were either local council or Home Office issued regarding emergency planning, radio operation, and suchlike. Also in the radio room were British Telecom points and filters as well as the main control panel for the air filtration and generator.

Leaving the radio room and turning right we passed through another room similar in shape to the dormitory (again now used for storage) that had no indication of its former use. However, there were a number of BT telephone points and coaxial sockets along the wall so it was probably a signals room for incoming and outgoing telephone communications. From this room a door led through a small void about two metres by four metres formed by the external stairs; this contained BT junction boxes and another door into the combined generator and air filtration room.

Plant room

The plant room was around two metres by about four metres and contained an early 1980s vintage Lister 100 KVA diesel generator and Luwa 100% air filtration plant. These have both been recently decommissioned by the council as they are no longer required and expensive to maintain. Within this room is also the hand pump for the diesel to refill the tank as well as two status and control panels for the generator. On the opposite wall are the control switches for the air filtration plant. The air filtration plant draws air in and expels air out independently from the rest of the building and vents into a 'well' on the outside of the building. Walking round the outside of the building a vent can be seen in approximately the right place but we had no way of telling if this was to do with the bunker; no other indication that there is a bunker beneath the street is visible.

Over time the bunker has fallen slowly into disuse and is now used purely as a storage area. The decontamination shower, generator and air filtration plant are all decommissioned yet extant – however all the radio kit remains intact and in working order.



The radio room, still fully equipped and working

Woking Civic Centre Offices still act as the central emergency planning control but their focus is solely on civil and natural emergencies such as flooding and – as recently experienced – snow, which delayed our visit by a number of weeks! However they have their meetings in more comfortable and less claustrophobic board rooms.

All in all this was a worthwhile trip with the radio room, original generator and air plant being highlights. The original architect also being on hand made it a thoroughly enjoyable and informative visit.

Source: Keith Ward

All photos by Nick Catford.

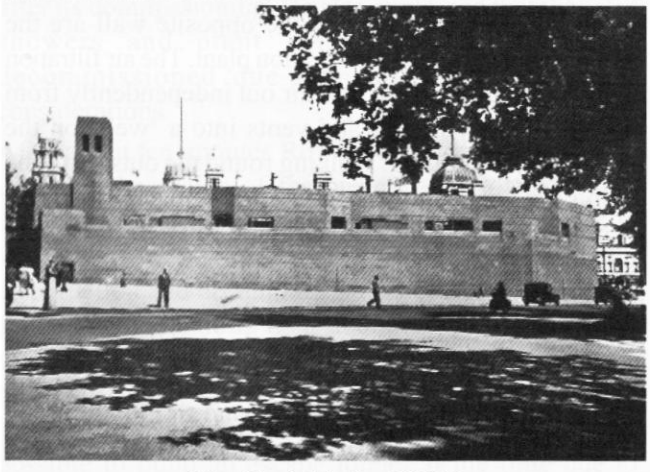
INSIDE THE CITADEL

Mystery of the Missing Gallery

Bill Hamilton

Churchill famously described it as "the vast monstrosity that weighs on the Horse Guards Parade". For more than sixty-five years the Admiralty blockhouse has remained a London landmark – yet swathed in mystery. Even today its thick walls protect some of the government's most closely guarded secrets.

Construction of the Admiralty Citadel on the corner of Horse Guards Parade and the Mall was completed in April 1942 after fifteen months of work. It provided bomb-proof accommodation for the Trade & U-boat Division, Operations Division, Plans Division and the Operational Intelligence Centre, including the Submarine Tracking Room of the Naval Intelligence Division, together with Admiralty telephone, telegraph and wireless communication facilities.



The Citadel during WWII

In the Submarine Tracking Room the known locations of U-boats, gleaned from High-Frequency Direction-Finding, signals analysis, shipping reports and the SHARK Enigma key, and of convoys, obtained from Navicerts, Lloyds and consular reports, were plotted on a large horizontal display of the North Atlantic. The aim was to show the current position of Allied convoys and the estimated positions of Axis submarines. But for the intelligence collated here the losses in the Battle of the Atlantic would have been very much worse.

Access to the Citadel was obtained through two blast-proof entrances from the Admiralty on ground level, and one at basement level, with two heavily protected emergency exits from the ground floor, one leading to Cambridge Green and the other to Horse Guards Parade. There are two further exits onto the roof which consists of a large concrete slab which, until 2008, was covered with six feet of earth. A final exit at basement level leads down to the network of deep tunnels under Whitehall.

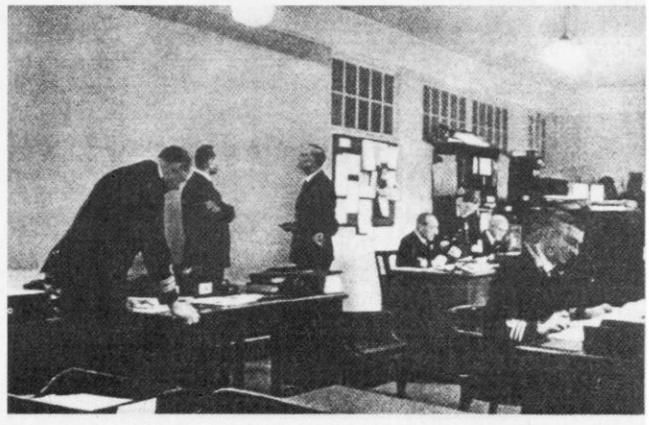
Above the roof is a tower, now redundant, which was part of the original air filtration system. Later the bunker was updated to operate completely sealed off from the external environment, conforming to Cold War nuclear, chemical and biological standards.

The Submarine Tracking Room was widely believed to be two-storied. When visited recently, it was clear that the internal layout of the Citadel could not have altered much because there are few partitions but many thick internal walls. The top level houses air-conditioning and filtration plant, and the natural insulation of the building means that it has never been heated. The main level, just a few inches below ground level, provides office space with one large central room, the only one with large steel blast-doors. All the individual rooms have low ceilings and vary in size. A single lift serves all three levels, with one staircase descending 100 feet from the basement to the tunnel access.

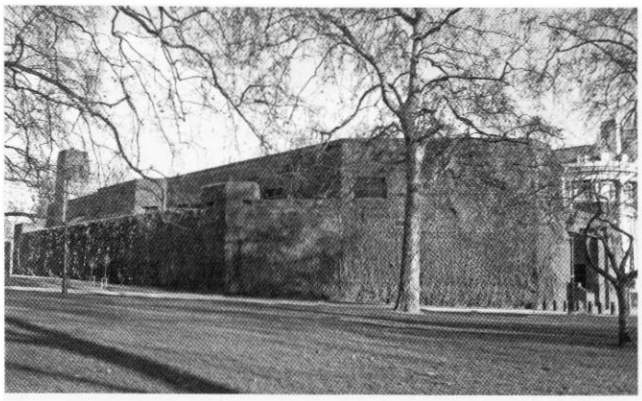
The lower level is filled with classified spaces containing communications equipment, some of the rooms having been configured as equipment bays, formerly filled with teleprinters and serviced by large cable ducts. Throughout, the walls are of painted concrete with no exposed steelwork. Basement rooms are numbered from 100, those on ground level from 200, the legendary days of Room 39 and Room 40 being long gone. [The original Rooms 39 & 40 still exist on the first floor of the Old Admiralty Building, overlooking Horse Guards Parade.]

The blockhouse, now known as St Vincent, remains part of the Ministry of Defence, though the adjacent Old Admiralty Building now serves as an annexe of the Foreign & Commonwealth Office. A wall plaque lists the commanding officers of "W/T Station Whitehall".

Up to the outbreak of World War II the Operational Intelligence Centre had occupied unsatisfactory quarters in six rooms and a passage on the first floor of the Admiralty. The move down to the sub-basement in late 1939 provided a better-equipped but still cramped interim



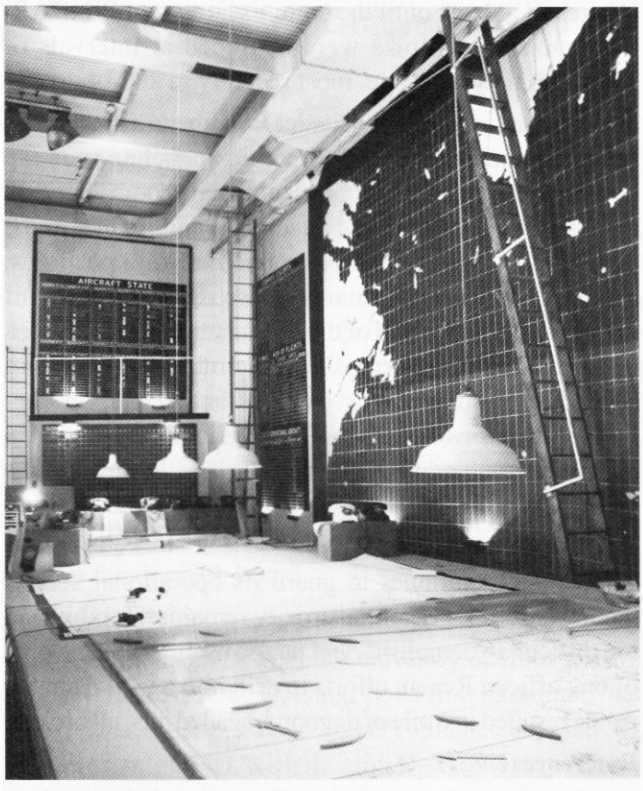
The Convoy Room. Organisation of convoys, planning of routes were jobs done in this room. Its staff knew the position of all merchant ships throughout the world at any moment.



Recent view of the Admiralty Citadel

space while the Citadel was being constructed. Patrick Beesly, writing in *Very Special Intelligence*, recalls this interim location as having a low ceiling with white-painted pipes and primitive air-conditioning.

The Operational Intelligence Centre, with Operations and Trade Main Plots, and War Registry moved into the Citadel in the spring of 1941, even before the building was complete. This provided quieter, more spacious accommodation with what Beesly describes as a much larger room for the submarine section. The opportunity



The Western Approaches Plotting Room at Derby House. Photo by Nick Catford

was taken to move the D/F Plot in there since their work was becoming increasingly bound up with the battle against the U-boats.

The precise location of the Submarine Tracking Room is of particular historic interest. Passing through the tight security to the Citadel today the interior is found to have altered little. Study of the MoD's floor-plans to identify a suitable two-storey space on the ground and basement levels proved fruitless: there is none. The floors are very thick, as are the walls, and none of the larger rooms on the ground level coincides with a similar space beneath. One can but conclude that the plotting room was on a single floor, unlike the Western Approaches plotting room at Derby House, Liverpool, where the commander could look down from his office in the gallery. In fact there appears to have been little need for an observation gallery for the purposes intended at the Admiralty Citadel.

In *Room 39* Donald McLachlan describes the Submarine Tracking Room of the Citadel as 'like a large billiard room'. This suggests a shadow-free lighting canopy over the central plot table. It appears to coincide with the large room at the centre of the building on the ground level. He adds that 'Around the walls were graphs of sinkings and new construction'. The description sounds claustrophobic, the main plot being horizontal, 'a centre table, seven or eight feet square, over which stretched a massive chart of the North Atlantic'. The Naval and Trade Plot was linked to the STR by an archway.

No authentic contemporary photograph is known to survive, although the recreation for the film sets of *Sink the Bismarck* were based upon first-hand recollections and are considered reasonably accurate by historians apart from the presence of naval ratings.

By the beginning of 1943 the Submarine Tracking Room was staffed by a team of eleven men and three women, all specialists. First task each morning was to plot the estimated positions of all U-boats at midday. This was followed by a three-way conference by scrambler with Western Approaches and Coastal Command. By noon intelligence would have been exchanged with Washington and Ottawa. At night it was the habit of senior officers to take a last look at the situation before turning in, as several of them slept in the Admiralty basement.

McLachlan records that 'There was an untidy, clattering bustle; hardly one of the small rooms had less than two telephone conversations going on; officers and civilians and 'secret ladies' moving about the narrow corridors with heavily labelled folders and dockets, teleprinter flimsies or illegible sequences of decoded signals. There was a smell of rooms never empty for more than a few minutes, used all round the clock. The Citadel quarters were admirably clean, ventilated and warmed by the standards of those days, but cut off by twenty feet of steel and concrete from the fresh air of St James's Park and the Mall.'

Thanks to Ian Fleming and other writers, Admiral John Godfrey's Naval Intelligence Division has enjoyed a celebrity that might have surprised his opposite numbers in the other intelligence services at the time. Although part of his NID, Godfrey necessarily delegated direction of the Operational Intelligence Centre and its Submarine Plotting Room, designated NID8. Here the vital work of

Aerial view of the Admiralty Citadel, alongside the Old Admiralty Building

Lt-Commander Rodger Winn RNVR

safeguarding Britain's lifeline across the Atlantic was conducted by a small team under the leadership of the gifted Lt-Commander Rodger Winn RNVR, a peacetime barrister.

For much of the war the OIC's ambassador to Whitehall, Captain 'Ruggy' Macintosh, represented it on inter-service intelligence and planning committees held in the Cabinet War Rooms, notably the Joint Intelligence Committee, a meeting of which features in Anthony Powell's novel *The Military Philosophers*. The amiable Ruggy, later to hold the office of Black Rod in the Houses of Parliament, was described in *Ringside Seat* as 'Not the fastest torpedo in the Navy'. However he proved invaluable: 'When we had reached the final draft of a paper we would show it to Ruggy, knowing that if he understood it, everyone else would too'. Despite the hospitality offered Ruggy by his counterparts in other services they were not invited back; then as now the Citadel remained sacrosanct to the Navy. This, and its formidable appearance, may have lent something to its nickname, the Kremlin.

During the Cold War the blockhouse was also used for a number of other technical and intelligence-related functions, being regarded as the most secure building in Whitehall at least until the commissioning of PINDAR. Communications links were upgraded at intervals of approximately a decade, most recently in 2003.

The foundations of the Citadel have been recorded as being nine metres deep, with a thick concrete roof cap protecting the equipment block and main rooms beneath it. In the event of a ground attack the building was to be defended from a number of loopholed firing positions, still visible. The site remains in use by the Ministry of Defence, and forms part of the Whitehall communications centre. An antenna farm is visible on the roof – as is a plenitude of surveillance cameras and sensors. Other communications links are carried via Trafalgar naval exchange in an adjacent tunnel, or directly through the Whitehall and Mall tunnels. It remains under 24-hour armed guard and unauthorised visits are not welcome.

The Citadel continues to guard its operational secrets well. Churchill's vast monstrosity remains "Too big and too difficult to demolish – and far too useful," in the words of one officer. Recent efforts to drill into a wall from the inside resulted in a pile of diamond-headed bits, all broken.

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Sub Brit meets Subte

Martin Dixon

On a short visit to Buenos Aires in Argentina, what Sub Brit member could resist exploring the temptingly named Subte – the oldest underground railway in the southern hemisphere? Today the network is over 50km long, comprises six separate lines and is completely underground.

Street entrance at Angel Gallardo on Line B

History

Like most underground systems of this age, the first lines were privately built by competing companies. What today is known as Line A was built by the Anglo Argentine Tramway Company and opened on 1 December 1913. It wasn't until 1930 that the rival company Lacroze built the next part of the network – today's Line B. Between 1934 and 1944 a further three lines were built by yet another competitor – Chadopyf (Compañia Hispano Argentina de Obras Públicas y Finanzas). Nationalisation followed under a series of different Buenos Aires (BA) transport organisations. In 1994 the service was privatised and is now managed by Metrovias. The sixth line opened as recently as 2007 and further expansion is both in work and on the drawing board.

Network

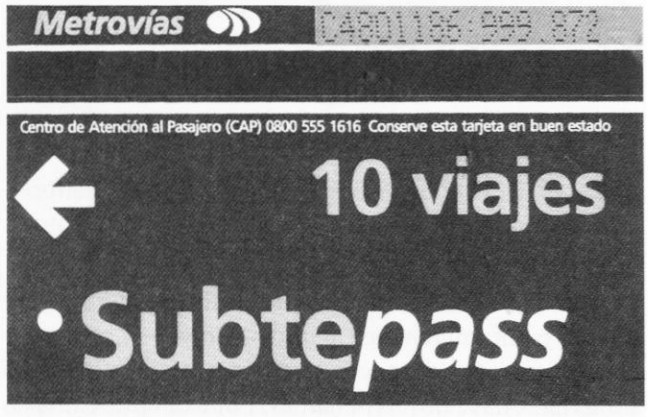
As mentioned above, six lines currently operate and are labelled Line A, B, C, D, E and H. At first I assumed that Line H was so labelled as F and G could be confused (by the short-sighted) with E and C. However, I now understand that Lines F and G have been planned but are not currently being built. Like the London Underground, each line is colour-coded at all points of reference; for example on line diagrams, station signs and directions for connections. The earlier lines are all essentially radial routes from the centre of the city into the suburbs; the latest Line H cuts across these in an arc in order to improve journey times across the city.

Technology

The majority of the early Subte was constructed using cut and cover techniques. Later lines and extensions also used 'proper' tunnelling. The whole system is built to standard (UK) gauge of 1,435mm (4ft 8 °in). This is in contrast to the majority of Argentina's surface passenger railways which use the wide 'Indian' gauge of 1676mm (6ft 6in). Unusually, not all of the network has the same traction supply. All the lines, apart from Line B, have overhead or catenary power supplies – either at 1100 or 1500V. Line B – dating from its days as a separate competitor system – operates on third rail 550V.

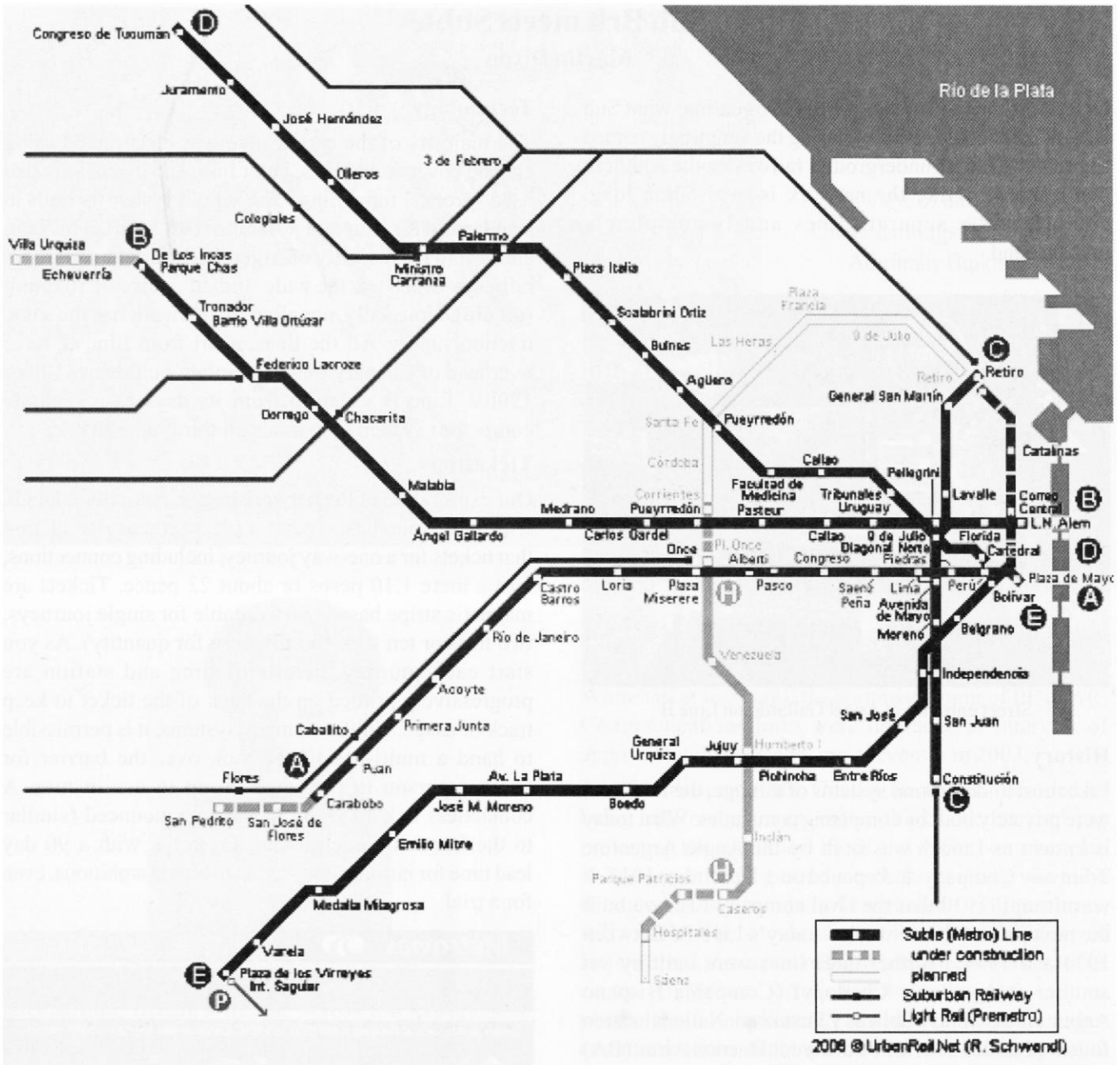
Ticketing

Our exploration of the network began, naturally enough, with ticket purchase. What a pleasant surprise to find that tickets for a one-way journey, including connections, cost a mere 1.10 pesos or about 22 pence. Tickets are magnetic stripe based and available for single journeys, two trips or ten trips (no discount for quantity). As you start each journey, details of time and station are progressively printed on the back of the ticket to keep track of usage. Unlike on many systems, it is permissible to hand a multi-use ticket back over the barrier for another person in the same group to use in turn. A contactless ticket system has been announced (similar to the London Underground 'Oyster'); with a 90 day lead time for introduction – which seemed ambitious, even for a trial.



Stations

All station entrances that we used led down from street level to an underground ticket office. Above the entrance stairs or escalators are illuminated letters (colour coded) showing which lines are in operation – which seemed very useful. These remained illuminated throughout our travels so we couldn't vouch for their effectiveness during maintenance or other closures. The station exits had excellent local maps showing street layouts and local attractions. The more modern Line H is much more

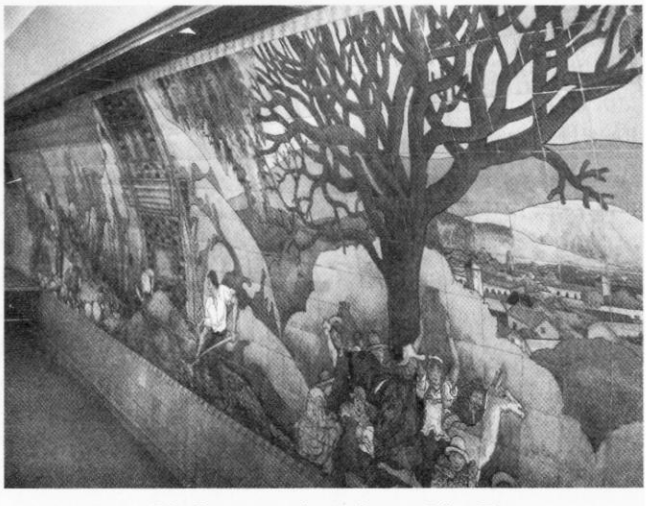


reminiscent of London's Jubilee line, but without platform-edge doors. The line colour, which is yellow, also features heavily throughout this line.

Despite the mainly radial nature of the lines, there are around eight interchange stations. However, caution is called for as the connecting stations on different lines sometimes have different names. For example, Lima on Line A connects with Avenida de Mayo on Line C. Bizarrely (to our way of thinking), new stations on Line H are being given different names to existing stations on other lines to which they connect. Line destinations are used to indicate platforms, in the same manner as the Paris Metro.

Station Art

A pleasing aspect of the stations (to my eyes) is that they retain many of the characteristics of the original lines and are not all carbon copies. In addition a number of the stations have specific artistic displays. These include small booths showing historic photographs, articles and documents relevant to the local area. There are also large-scale tiled pictures and stained glass - some dating



Platform mural at Jujuy on Line E

back to 1934. Argentina, including the nation's capital, is a rich source of fossils of dinosaurs and other prehistoric fauna. Such remains have been discovered during construction at a number of locations and are on display at Juramento (Line D) and at Tronador (Line B).

Rolling stock

The lines have a great variety of rolling stock, covering a wide range of ages. Line A still has wooden panelled stock (reminiscent of Parisian *'Sprague'* carriages) with windows that open completely (I'm sure a nightmare for European Health & Safety legislation). These were built by La Brugeoise of Belgium as long ago as 1919 (though refurbished in 1926) and claim to be the oldest rolling stock on any metro system worldwide. Other stock comes from a multiplicity of manufacturers including Fiat, Siemens, Mitsubishi and Alstom.

Platform Art at Humberto I on Line H

Interior of Line A rolling stock from 1919

Some of these purchases have been of second-hand units from the Japanese cities of Tokyo and Nagoya. All services we saw of all vintages still had two crew – a driver and a separate guard on board.

In summary

Overall the Subte was efficient and intriguing and deserves to be on the itinerary of anyone visiting Buenos Aires. Enquiry at several bookshops drew a blank when attempting to find any published literature on the network's history but the websites listed below have English versions that give more details both of the network's history and of current projects. Just as Buenos Aires is often known as the Paris of the South, Subte has a distinctly European feel and is a successful mix of history and modernity.

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http://www.sbase.com.ar/en//Subterraneos de Buenos Aires (network owner)
http://www.urbanrail.net/am/buen/buenos-aires.htm
Wikipedia - Good line by line summaries

A Practical Use for Cats

An unsubstantiated item of Derbyshire folklore claims the application of a cat to useful purposes, in connection with the development of lead mining at Bole Hill, near Wirksworth. Here shafts had been sunk, and lead ore raised, to considerable depths, until the water-table was reached necessitating expensive pumping if mining was to follow the ore deeper.

From 1772 a drainage tunnel (the Meerbrook sough) was driven under the hill from the valley of the river Derwent, intended to connect with a shaft then of the order of 200 metres deep. The tunnel was not in one straight line, as it made diversions from time to time to follow veins of galena as they were encountered. After 26 years or so, when the tunnel was getting close to the shaft, the question arose how to effect the meeting or the two with least wasted labour.

The solution, local legend has it, was provided by a cat, taken along the very wet tunnel into the heart of the hill. Boring was commenced at the bottom of the shaft at a pre-determined time. The cat in the tunnel turned to look in the direction of the sound, thus indicating the exact alignment needed for the final length of the drainage tunnel. This was repeated several metres further along the same tunnel, allowing the determination of the shaft's location by triangulation.

The World War II Deep Air-Raid Shelter at Kenley, London Borough of Croydon

Paul W. Sowan

World War II deep public air-raid shelters in context

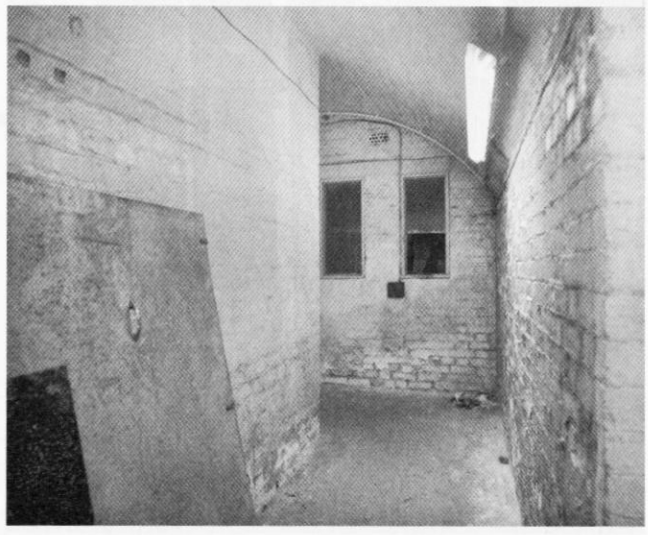
Deep tunnelled air-raid shelters, as distinct from roofed-over trenches, became common early in World War II. However, some are known to have been constructed during World War I, such as those noted by Simeon Priest at Abbey Wood in 1919, described by him as 'extensive underground galleries' penetrating the chalk and 'free from water when the marshes are dry.' Rod Le Gear (2007) has noted another possible First World War shelter at Cliftonville (near Margate). The threat then was bombs dropped by German airships (Zeppelins): London was so attacked in June 1915. World War II of course brought aeroplanes, and then V1 unmanned flying bombs and V2 rockets.

The main entrance to the tunnel complex.

During the 1930s, with war increasingly seen to be inevitable, both central and local government gave some thought to protection from air raids. Parliament in due course enacted the Air Raid Precautions Act in 1937, and the Civil Defence Act in 1939. J.B.S. Haldane, in 1938, campaigned for public air-raid shelters.

Ove Arup's 1939 book on the design of shelters dealt largely with surface and cut-and-cover structures, as did Donovan Lee's in 1941. Lord Hailey's Committee reported to the government in April 1939 that 'bomb-proof shelters .. deep or heavily concreted .. should not be provided for the general public.' There was, it was suggested, a danger of panic and the development of a 'deep shelter mentality' and the risk of persons going and staying underground, unwilling to return to the surface. It was also felt that the nation could not afford to divert manpower and resources to deep shelter construction. It was, for example, estimated that to drive 25 kilometres of tunnels to accommodate 160,000 shelterers would take two years 'in peace-time conditions.' The London Underground was stated officially not to be available for sheltering. The public disregarded this and moved in anyway. Nevertheless, by this time, some deep shelters had been created by local authorities, at Finsbury and Harrow for example. Mallory and Ottar summarised the findings of the Hailey Committee, and the 'deep shelter controversy.'

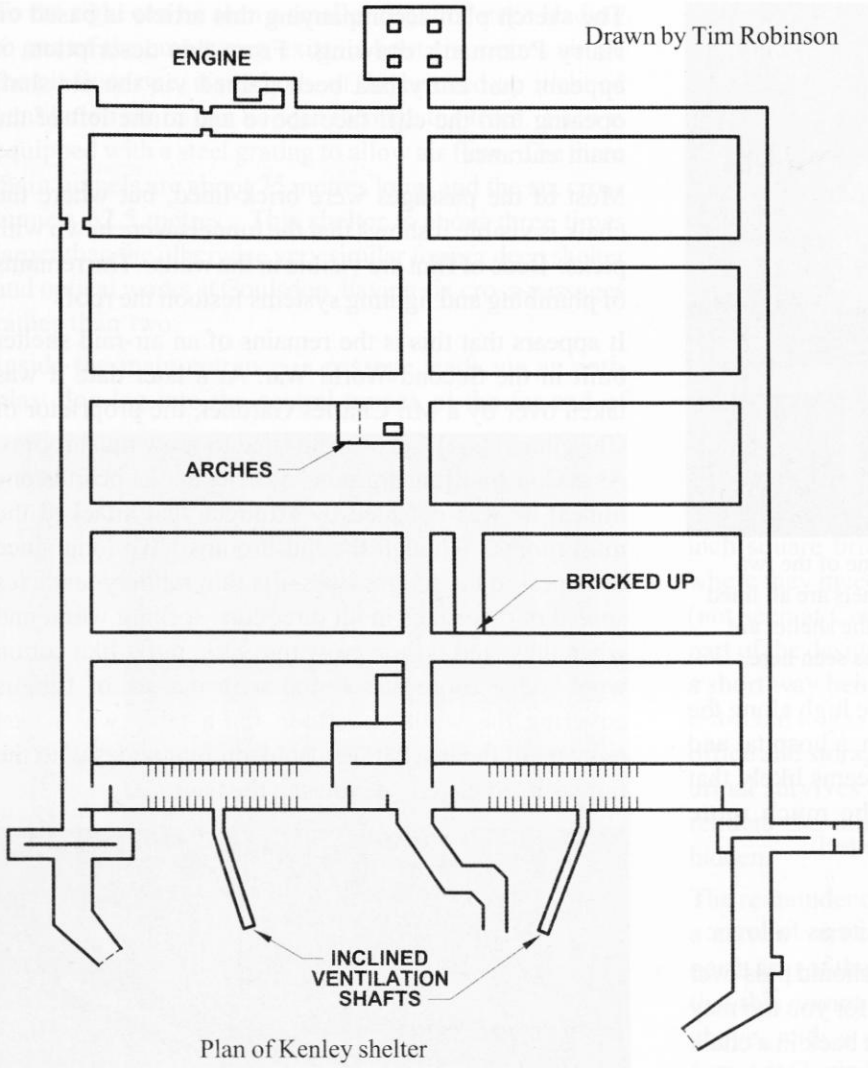
Heavy night-time bombing of London commenced on 7 September 1940. For 57 nights there were raids every night. From 7 September to 15 May 1941, 18,000 tons of bombs fell on the capital. On 17 September 1940 a crowded Marble Arch Station suffered a direct hit. At Balham Tube Station another bomb severed gas, electricity and water mains: 64 of the 600 persons in the station died. Another 111 died at Bank Station in January 1941. Saddest of all, as late as 3 March 1943, 173 people were crushed to death when panicking shelterers tried to enter Bethnal Green Station as a result of what turned out to be a false alarm.



During construction a room was provided in one of the emergency exit dog legs; its original purpose is unknown.

In October 1940 the Government allowed some 'limited' tunnelling under the direction of the newly appointed Minister of Home Security, Herbert Morrison. It was decided to form ten deep tunnel shelters below existing tube stations, two on the Central Line, and eight on the Northern Line, each designed to hold 8,000 people. None of them was completed before the end of the 'Blitz' in May 1941.

Although predominantly daytime bombardment had been expected, nocturnal raids were in fact the standard pattern. Thus it was that provision was made for safe places outside central London for people to sleep at night. These included pre-existing tunnel systems such as the extensive chalk mines at Chislehurst (the 'Chislehurst



Plan of Kenley shelter

Caves'). According to O'Brien, from 12 – 15,000 people sheltered during the Autumn 1940 air raids in these 'caves'. They had been provided with electric light and water by two private citizens. The shelter was eventually taken over by the local authority. This author also tells us that, following examination of the possibility of boring tunnels in the chalk hills of south London, schemes were made for shelters in Bostall Woods (Woolwich), and Jack Cade's Cavern (Blackheath). Both of these were abandoned at the end of 1941 on the grounds that construction would divert labour needed elsewhere.

The North Downs tunnelled shelters

Five shelters tunnelled into the chalk were planned for east Surrey, of which four were completed.

(1) Ashley Road, Epsom
(2) Longdown Lane, Epsom
(3) Brighton Road, Coulsdon
(4) Godstone Road, Kenley
(5) Chipstead Valley (abandoned unfinished)

The Ashley Road shelter has been described by Henderson, Hillman and Pearman (1968). That at Longdown Lane was the site of an unsuccessful recent attempt by Subterranea Britannica members (with permission from the golf club in whose grounds it lies) to re-excavate a back-filled entrance cutting. The Brighton Road shelter was described (Morgan and Sowan) in 2000. Construction at Chipstead Valley was abandoned, on account of unsuitable ground conditions, before it was completed. The Godstone Road, Kenley, shelter is described below. These large shelters, generally in not heavily built-up areas at the time, seem clearly to have been, as at Chislehurst, for overnight accommodation for people from a distance – not for use in immediate response to an air-raid warning.

Location of the Kenley shelter

This structure is at TQ 323603, on the east side of the A22 Godstone Road, about 100 metres from Kenley Station. Three parallel tunnels were driven approximately north-north-eastwards into the chalk face in a small roadside chalk pit under steeply rising ground on the west flank of Riddlesdown, with six further tunnels at right-angles linking them into a rectangular grid pattern. RAF Kenley airfield, an obvious World War II target, is a little over two kilometres to the south. The main London to Brighton railway line, with junctions at Purley, is about two kilometres to the northwest.

Site history

The chalk pit (one of two such small pits at road level on the southwest side of Riddlesdown) is shown on the Ordnance Survey's 1:2,500 plan surveyed in 1867-68, re-levelled in 1911, revised in 1943, and published in 1947, where it is labelled 'old chalk pit.' It appears on the first edition of that sheet, so had been established by the date of the initial survey. It was doubtless eclipsed as a source of chalk or quicklime by the establishment, about the 1820s, of the very much larger Rose & Crown chalk pit and limeworks (closed in the 1960s) at TQ 328594, a little over 1.5 kilometres further south along the Godstone Road.

The tunnel entrances and air shafts are not shown in the post-war revision. The tunnels appear to have been excavated early in 1941, but have since the autumn of 1966 been used as an optical works.

Valerie Parkin, who informs us she was born in 1941, reported that she and her mother "lived in the Kenley caves" and made them their home for two years. Her 'recollections', presumably based on her mother's later

The north parallel corridor leading to one of the two emergency exit tunnels. The entrance tunnels are all lined in brick but many of the tunnels within the shelter are lined with sheets of corrugated metal as seen here.

accounts, note tiers of bunks two or three high along the tunnel walls. "There was also a canteen, a hospital and washing facilities. Even a church!" It seems likely that there is some confusion here with the much more extensive and organised Chislehurst shelter!

The 1957 description

Harry Pearman described visits to this site as follows:

"Serious antiquarians and archaeologists should pass over this item, but explorers can stay with us, for you too may be curious about a group of entrances set back in a chalk cliff at Kenley - N.G.R. TQ 323 603. There are five entrances, three at ground level and two about 15 feet up. They are just off the A22 behind a bus stop 1 mile south of Purley, at the junction with Hayes Lane.

These entrances were always securely closed, but in 1957 it was noticed that a piece of corrugated iron closing one of the upper holes had been bent back enough to permit entry. We had nothing but a box of matches but we crawled in and found ourselves in a five foot high passage, hewn out of the upper chalk. After 25 feet [7.7 metres] we stopped at the edge of a vertical drop of unknown depth.

We returned later at dead of night and excitedly donned full caving kit to explore the new tunnels. Fred Topliffe led the way and stopped at the top of the drop and shone his light down it. He found himself looking down on a water closet. We climbed down, using the available fittings and came out into a lower passage and found that the lavatory was one of fifteen, each in a cubicle along the wall, and on the other side of the passage were another fifteen. Turning right we crossed another passage at right angles and entered a further passage with another 30 W.Cs in it. After this we got into open passage again and found that the system was laid out as in Fig. 15."

The sketch plan accompanying this article is based on Harry Pearman's drawing. From this description, it appears that entry had been gained via the air shaft opening into the cliff face above and to the left of the main entrance.

Most of the passages were brick-lined, but where the chalk is visible it shows that the tunnels were hewn with picks. Beds of flint are visible in the walls. The remains of plumbing and lighting systems festoon the roof.

It appears that this is the remains of an air-raid shelter built in the Second World War. At a later date it was taken over by a Mr. Charles Gardner, the proprietor of Chiselhurst [sic] Caves, who tried to grow mushrooms. As at Godstone [underground quarries and/or hearthstone mines] he was defeated by a fungus that attacked the mushrooms. Though the mushrooms have long since disappeared the fungus lives. Its thin rubbery tentacles spread out like fans in all directions seeking wood and when they find it they grow into little puffs like cotton wool. One room was found with masses of fungus covering the walls and floor. On a table was a last remnant of the lost battle: a book on fungicides with the fungus itself eagerly devouring the pages.

Although most of the tunnels are lined, either in brick or corrugated metal, some areas remain unlined like this workshop in the centre of the complex.

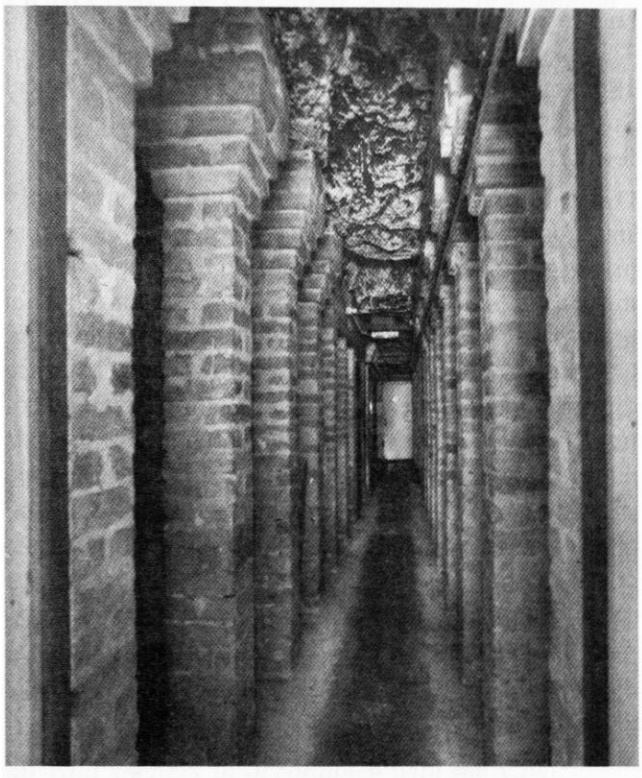
Supplementary descriptive notes and comments

Harry Pearman's description cited above may be supplemented by the following additional details.

The floor of the former chalk pit is now used as a car park for staff and visitors. The main (central) entrance to the shelter is by way of a flight of steps and terrace outside the main door. Here, also, is a fitting for a small crane, erected as required, when heavy equipment is delivered or removed. What the nature of the entrance was during the war, or during the period when mushrooms were grown here, is not known. The tunnel entrance is about two metres above the old chalk pit floor.

To the right can be seen a smaller flight of steps leading to one of the emergency exits. About six metres above the pit floor one, if not both, of the bricked-up inclined ventilation shafts can be seen through the trees. Each is equipped with a steel grating to allow air flow. The three main tunnels are about 75 metres long, and the six cross tunnels 62.5 metres. This shelter is about three times larger than the otherwise very similar former deep shelter and optical works at Coulsdon, having six cross-passages rather than two.

Inside the main entrance, a passage leads via an anti-blast dog-leg into the central tunnel, at the far end of



The first cross tunnel has 60 toilet cubicles in two blocks of thirty either side of the main spine tunnel. From the centre of these two blocks there is a steeply inclined ventilation tunnel in the roof.

which is a large room of unknown purpose. This room is wider and higher than the tunnels, and is shown on Harry Pearman's sketch plan published in 1963 as having, then, what appear to be four support pillars. The two parallel tunnels either side lead in from emergency exits for the optical works, protected by substantial internal blast walls, dating from World War II.

Both arms of the first cross-tunnel accommodated both W.C. cubicles and (at the outer ends) primitive urinals. The 60 cubicles were presumably used by both sexes. Cisterns and lavatory pans have, mostly, been removed. It appears that mains water was laid on for flushing the toilets. The urinals, which survive *in-situ*, were no more than half-round earthenware gullies set in the floor against the outer wall. The presence of manhole covers inside and outside the shelter suggests that these facilities were linked to the main sewer under Godstone Road from the outset. The right-hand lateral tunnel has been left more or less in its original state, other than the modernisation of the first one or two cubicles for current needs.

Part-way along this tunnel the inner end of the southern ventilation shaft can be seen. What is visible is a steeply inclined rock-cut shaft. Pearman's description (apparently of the northern shaft) seems to imply a level passage in from the cliff face, followed by a vertical shaft down to the W.C. cubicles, rather than a steep incline as seen here. The exact alignments and inclinations of these two shafts thus appear to differ, and might repay investigation

The cubicles have shoulder-height half-brick thick partition walls, abutting at their outer ends against nine-inch square brick support pillars, corbelled at the top where they meet the ceiling. This extensive roof support (not seen at Coulsdon) may reflect some doubts on the part of the designer concerning the stability of this tunnel a short way behind the open chalk pit face. Most of the left-hand toilets tunnel has now largely been modified as office and storage accommodation, although the disused urinal survives at the far end. An inserted ceiling here renders the inner end of the second ventilation shaft hidden.

The remainder of the ventilation arrangements comprise a narrow vertical shaft with a fan at the bottom in the north arm of the innermost cross tunnel. It is understood that this communicates with an iron pipe in the hillside above, with a conical iron cap to keep rain out, as is found at Coulsdon.

The tunnels are of much the same cross-section (two to three metres wide and high) as those at Coulsdon, and likewise largely brick-lined.

As at Coulsdon, there are a few spaces additional to the main tunnels grid, one side or the other of the central tunnel, between the first, second and third cross-tunnels A condition survey for Coulsdon identifies at that site, apart from toilets, provision for a canteen, a warden's office, and the base for the vertical ventilation shaft.

Specific interesting features of the Kenley Shelter

The shelter closely resembles that at Coulsdon, with three parallel main tunnels, a number of cross-tunnels at right angles to them, chicanes and blast walls at the tunnel entrances, several small side rooms, and a vertical ventilation shaft.

Apart from being very much larger, it differs from Coulsdon in several respects.

(1) The Kenley shelter is tunnelled into the abandoned working-face of a pre-existing small chalk pit: whereas at Coulsdon the site before construction was simply an open field (the description of this site as an 'old chalk pit' on some Ordnance Survey maps and plans is erroneous);

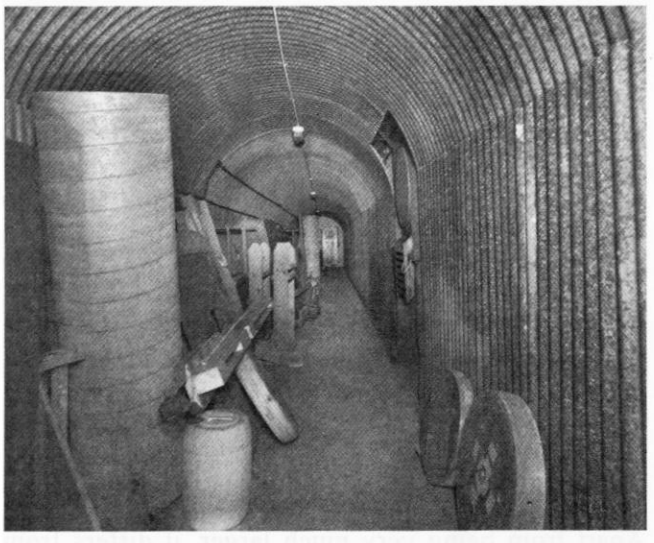
(2) The Kenley shelter is tunnelled into a much more steeply rising hillside than that at Coulsdon;

(3) It is not immediately obvious how or where the tunnel spoil was disposed of: whereas at Coulsdon this was used in part to add cover to the eastern part of the shallow depth of chalk above the tunnels, and possibly to build an anti-blast bank outside the entrances;

(4) The tunnel entrances are about two metres above the floor of the pre-existing chalk pit: whereas at Coulsdon they are more or less on the same level as a flat piece of ground and the main Brighton Road; although in general (as made so clear at Bethnal Green) flights of steps are undesirable at shelter entrances, it has to be remembered that this shelter was probably used as safe sleeping quarters at night, not as a place of immediate resort on the sounding of an air-raid siren;

(5) At Kenley, the vertical air shaft is supplemented by two steeply inclined rock-cut shafts which open to the upper part of the chalk pit face: Coulsdon (being smaller) has only a single vertical shaft;

(6) At Kenley there is a large chamber at the inner end of the central access tunnel, considerably wider and higher than that tunnel; the purpose of this is unclear, although it may simply reflect what tunnellers call 'overbreak' – that is to say, more rock than intended fell in from the tunnel ceiling and sides during construction. The ceiling here as originally formed appears (from Pearman's plan) to have been provided with four support pillars (that have now been replaced by an arrangement of steel girders). The most likely use of this space is as a canteen.



Most of the internal tunnels have been used by Optical Surfaces for workshops etc. but one cross-tunnel has not been used other than for storage and remains in original condition. As can be see the corrugated sheeting is in surprisingly good condition.

Optical Surfaces Ltd

The occupants, Optical Surfaces Ltd, lease the shelter from the Corporation of London, owners of the Riddlesdown public open space.

Optical Surfaces Ltd was in a sense a descendant of Cox, Hargreaves, and Thomson Ltd, who had used the Coulsdon shelter in the 1950s and 1960s, following an active search for a location as free as possible from traffic or other vibrations, and with very stable atmospheric conditions. The nature of this precision manufacturing business requires a very constant temperature (it varies within the tunnels by no more than half a degree Celsius) and freedom from vibration. Cox, Hargreaves, and Thomson Ltd vacated their Coulsdon works in 1961 or 1962, surviving a few more years as a company. Optical Surfaces Ltd took over the Coulsdon site licence for a few years, but never occupied the Coulsdon tunnels.

Optical Surfaces Ltd manufactures very highly specialised mirrors, lenses, and prisms, by grinding from blanks of various compositions including glass, ceramics, metals, and silica. Silicon carbide is used for the main grinding, and cerium oxide for final polishing. Computerised testing equipment allows optical surface dimensions to be measured in terms of wavelengths of light. They are the only UK manufacturers of off-axis paraboloid mirrors. These and other products are used in high-power laser laboratories, astronomical observatories, and satellites. Silvering and coating is contracted-out.

The firm had to negotiate access to the Kenley shelter in the light of an Act of Parliament which stipulated that the tunnels might be requisitioned for Civil Defence purposes in the event, during the Cold War, of the 'four-minute warning' being sounded, indicating imminent nuclear missile attack. However, it took them four days to clear a pathway to the main entrance!

The shelter (the firm's only premises) now houses offices, grinding machinery, testing equipment, and stores, and employs about 15 highly skilled personnel. The tunnels are now mostly lined and brightly lit, although in some places unpainted brickwork or unlined chalk are still visible.

Acknowledgements

We tender our thanks to Optical Surfaces Ltd, and to John Mathers in particular, for historical details and for allowing us access and to photograph unaltered aspects of the shelter tunnels. It should be emphasised that the firm would not generally welcome further requests for visits.

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Sketch plan of Kenley Deep Public Air-Raid Shelter (see page 51)

Based on the 1:640 scale plan [CRG 2] accompanying Harry Pearman's description of 1963. The clearly erroneous details in the original of the air vents opening to the cliff face have been omitted.

By analogy with the Coulsdon shelter, the spaces additional to the main tunnels are likely to have included a warden's office and a canteen. A first aid station also seems likely.

All photos by Nick Catford.

The World War II Portsdown Tunnel Shelters

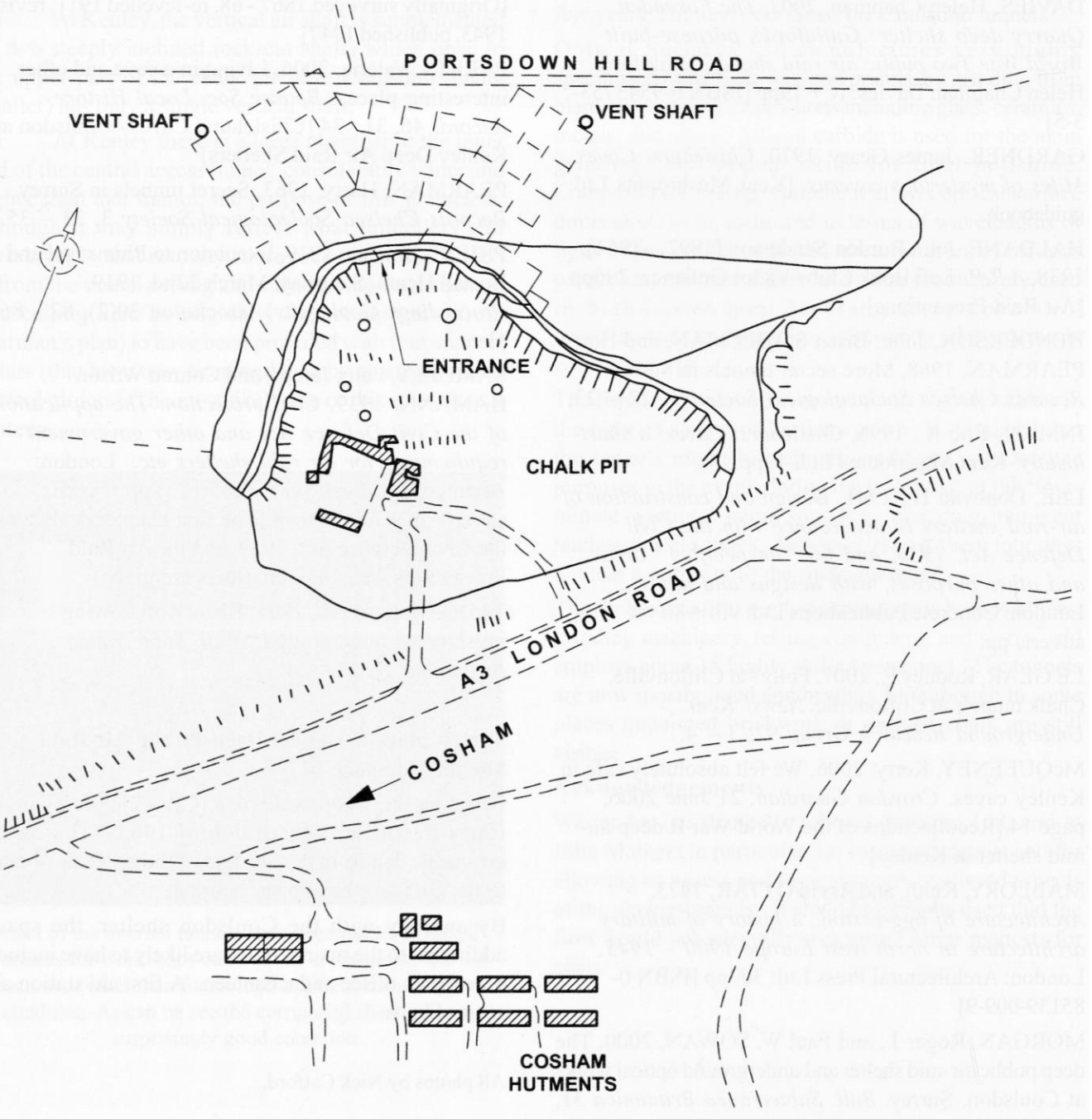
By Neil Conlon

Excavating the Tunnel Shelters

Forming part of the South Downs, Portsdown Hill is a ridge of chalk some seventeen miles long, rising four hundred feet above the Hampshire coastline at its highest point. The chalk has been tunnelled and excavated at a number of sites here since Roman times, in order to provide building materials and conceal various military installations. Chalk is easy to tunnel, and because of the depth of the hill, provides considerable lateral cover with an accessible horizontal shaft.

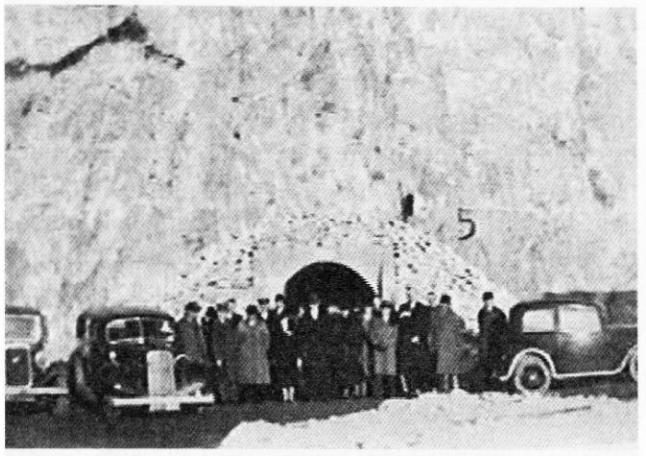
Many of the tunnels bored into Portsdown Hill over the centuries were extended and added to in the late thirties and early 1940s to meet the requirements of a country at war. By 1941 an underground annexe for the Supermarine aircraft factory was established in existing caverns, near Boarhunt, while elsewhere a huge subterranean oil fuel store was completed for the Royal Navy. Fortunately the expertise gained from the latter of these undertakings became available in time to be fully utilized in the excavation of the Portsdown tunnel shelters.

In 1940 the construction company of McAlpine had provided a team of men to tunnel the huge extension to the Royal Navy's underground oil fuel storage depot which lay beneath the hill to the west of Fort Southwick.



Drawn by Tim Robinson

Accounts of this undertaking indicated that the work was arduous and the accidents many. Injuries resulted from unexpected falls of chalk from the unsupported roof of the huge caverns and poor site management, it was reported, led to the deaths of two Irish labourers who were buried alive in concrete. McAlpine's men were probably apprehensive, therefore, to learn that their next task would be yet another tunnelling project.



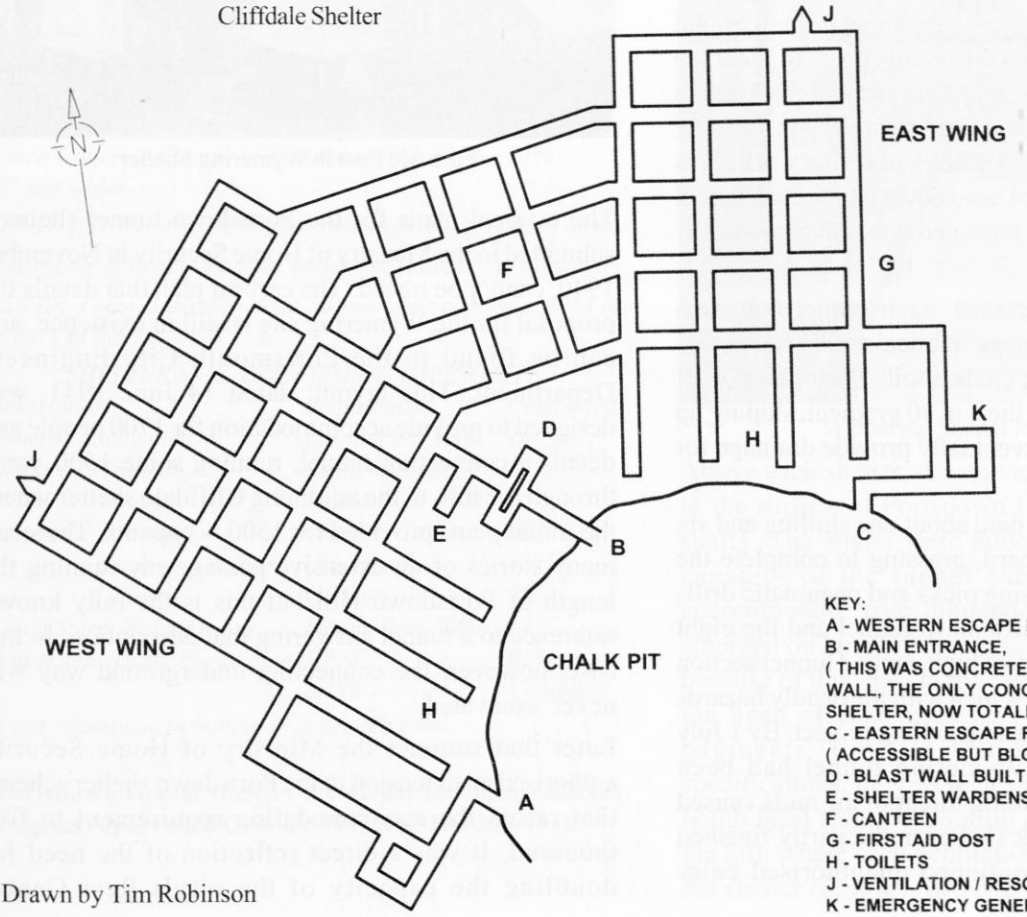
Wymering Shelter during WWII

Supervising the Portsdown Tunnel Shelter project on behalf of the Portsmouth City Council was Assistant Chief Engineer Donald Exley. He clearly remembered the events of Thursday 5 June 1941, when he first learnt of the tunnel shelter scheme. At that time Exley was working at the Royal Beach Hotel, Southsea, the temporary headquarters of the City Engineer, Joseph Parkin. Parkin directed his assistant to join the contractors at the Cliffdale site on 9 June and Exley recalled the great haste involved in progressing with the newly authorised plans. His initial instructions consisted of little more than scribbled notes and drawings on four sheets of foolscap paper, but despite this unceremonious beginning the project did not suffer from any lack of foresight or inadequate planning.

At this stage of the war all new shelters were the subject of extensive regulation and control and two years of hard-learnt lessons were not lost to Portsmouth's ambitious scheme. Now well aware of the design requirements for safety, health and hygiene, the Ministry of Home Security, working with the Ministry of Health, did not wish any of the new tunnel shelters to develop into the unregulated mass shelters such as those established unofficially in the Chislehurst caves in Kent, or in the underground warehouses of east London.

At these places, during the autumn of 1940, in the most squalid and disorganised conditions, Londoners crowded together to seek refuge from the nightly threat of bombing. Many other unofficial shelters were established in and around the capital at that time including, of course, the London underground railway stations and the infamous Tilbury railway arches. As the need to take refuge became more routine, individuals at many of these sites were able to establish order and in some cases introduce simple sanitation and canteen facilities. Notably, the shelters

Cliffdale Shelter



KEY:
A - WESTERN ESCAPE ROUTE
B - MAIN ENTRANCE,
(THIS WAS CONCRETE LINED UP TO THE BLAST WALL, THE ONLY CONCRETE LINING IN THE WHOLE SHELTER, NOW TOTALLY BURIED)
C - EASTERN ESCAPE ROUTE,
(ACCESSIBLE BUT BLOCKED OFF)
D - BLAST WALL BUILT OF BRICK
E - SHELTER WARDENS OFFICE
F - CANTEEN
G - FIRST AID POST
H - TOILETS
J - VENTILATION / RESCUE SHAFTS
K - EMERGENCY GENERATOR ROOM

Drawn by Tim Robinson

established in the Chislehurst caves, which held from 12-15,000 people, eventually boasted the facilities of water, electric light, and after considerable publicity by the Press, even received bunks and a medical aid post at the government's expense.

King George VI visits Wymering Shelter

Back in Portsmouth the excavation sites at both Wymering and Cliffdale provided an excellent base from which tunnelling could proceed and, after consultation, Exley and the McAlpine team decided upon the best way to approach the task. The plan was to drive a number of tunnels directly into the chalk and link these by cross galleries in order to form the shelter complex. At Wymering the plain, south-facing chalk pit lent itself well to this method of excavation, whereas the angled face of the Cliffdale site necessitated joining two sets of primary tunnels with a more elaborate system of crossing galleries.

Work commenced by establishing the entrances of the primary tunnels some ten to fifteen feet above the floor of each chalk pit. In this way the excavated chalk was used to backfill the pit below the tunnel entrances and gradually raise the floor of the entrance site to meet the tunnel mouths. This simple expedient enabled chalk debris to be disposed of without the need for an expensive and, in wartime, rare convoy of vehicles to do the work. This still left fifty to sixty feet of head cover above each tunnel and, at this time, this was considered to make the shelter virtually bomb-proof.

As the excavation progressed, each tunnel bore was provided with a narrow-gauge 'jubilee' track and wagons to aid the disposal of the chalk spoil. The operation of this railway was aided by the 1 in 80 gradient, sloping up into the hill, that would eventually provide drainage for the primary tunnels.

The labourers, who were paid about one shilling and six pence an hour, worked hard, pressing to complete the shelters before winter. Using picks and pneumatic drills the soft chalk was not difficult to tunnel and the eight feet three inch wide, nine feet high, arched tunnel section did not present McAlpine's men with the deadly hazards experienced during their last tunnelling project. By 1 July 1941, 420 feet of the Wymering tunnel had been completed and the continuing threat of air raids caused some local people to seek shelter in the partly finished galleries. Eventually, continued unauthorised entry became such a problem that guard pickets were posted at each site to keep would-be shelterers away.

Another problem also arose that month. Up until this time McAlpine's labourers had been lodging at Fort Southwick, as guests of their former employers, the Royal Navy. But when this accommodation was needed the team of workmen found themselves homeless. Despite requests for accommodation by the Town Clerk that appeared in the Portsmouth press: "Unaccompanied workmen engaged on heavy work require board and lodging for 28 to 30 shillings per week," the acute shortage of housing provided nothing locally. The problem was finally solved by obtaining material from an unusual source. Two huts, purchased from a pig farm at Warnford, were erected at the Cliffdale site and converted into living quarters for the men. This new arrangement, although makeshift, had the advantage of the nearby "George" public house where hard-earned wages could be spent on liquid refreshment at the end of each day.

First Aid Post in Wymering Shelter

The original plans for the Portsdown tunnel shelters, submitted to the Ministry of Home Security in November 1940, cannot be traced. The earliest plan that details the proposal for the Wymering site is still in existence, and can be found in the Portsmouth City Engineers Department. This layout, dated 14 June 1941, was designed to provide accommodation for 1700 people and details a connecting tunnel, running some 1500 yards through the hill, to the adjoining Cliffdale shelter where the initial plans provided for 1500 occupants. There are many stories of an extensive passageway running the length of Portsdown Hill but this is the only known reference to a tunnel answering that description. In this case, however, the connecting underground way was never excavated.

Later that summer the Ministry of Home Security authorised an extension to the Portsdown shelter scheme that raised the accommodation requirement to five thousand. It was a direct reflection of the need for doubling the capacity of the city's Rest Centre

accommodation and, when the Ministry of Health had fully assessed Chatfields findings, the need for a larger shelter facility was clearly seen.

The need to increase the shelter space initially led the City Engineer to propose that a third tunnel complex be considered. It was suggested that this new tunnel be excavated into the exposed face of an existing chalk quarry that was located to the north of Paulsgrove, almost a mile to the west of Wymering. Why this idea was rejected is unclear. Most probably it was considered that this third site was not as accessible as the Cliffdale and Wymering sites or, perhaps, the War Department, who owned all the land on Portsdown Hill, would not agree to tunnelling so close to Fort Southwick.

Finally, the space needed for additional shelter accommodation was gained by extending the two initial excavations, pushing the tunnels further back into the hill and adding new galleries. This now provided a total of 2535 places at Cliffdale and 2565 places at Wymering.

By the autumn of 1941 the progress of the Portsdown tunnel shelters was being closely monitored by the Regional Technical Officer. His weekly report, dated 20 October, noted that the general excavation of the 4545 feet of tunnels at the Wymering site was complete. The complete report is given in table one.

SHELTER No. 1: WYMERING CHALK PIT

Description	*Requirement*	*Completed*
General Excavation	*Linear Feet 4545*	*100%*
Tunnels: Trimming	*Linear Feet 3724*	*45%*
Lining	*Linear Feet 2724*	*30%*
Junctions: Trimming	*Quantity 70*	*35%*
Brickwork & Piers	*Quantity 70*	*77%*
Lining	*Quantity 70*	*33%*
4 inch Storm Water Drain	*Linear Feet 2965*	*75%*
3 inch Concrete Floors (7 feet wide)	*Linear Feet 4460*	*75%*

VENTILATION Excavation to ventilation shafts (Qty 2) and concreting of upper chamber under detonation slab complete.

SEWER From Harleston Road laid and passed to site, filled in to back of houses.

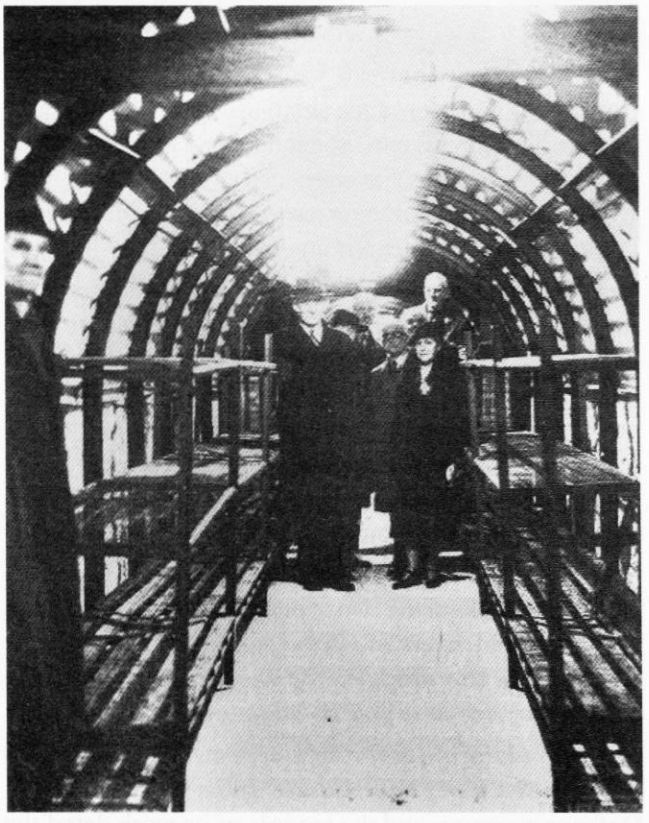
SHELTER No. 2: CLIFFDALE CAMPING SITE

Description	*Requirement*	*Completed*
General Excavation	*Linear Feet 4700*	*100%*
Tunnels: Trimming	*Linear Feet 3800*	*20%*
Lining	*Linear Feet 3800*	*1%*
Junctions: Trimming	*Quantity 74*	*39%*
Brickwork & Piers	*Quantity 74*	*46%*
Lining	*Quantity 74*	*39%*
4 inch Storm Water Drains	*Linear Feet 3000*	*14%*
Ventilation Shafts Excavation	*WEST*	*92%*
	EAST	*Complete*

Sewer Complete to bottom of approach road.

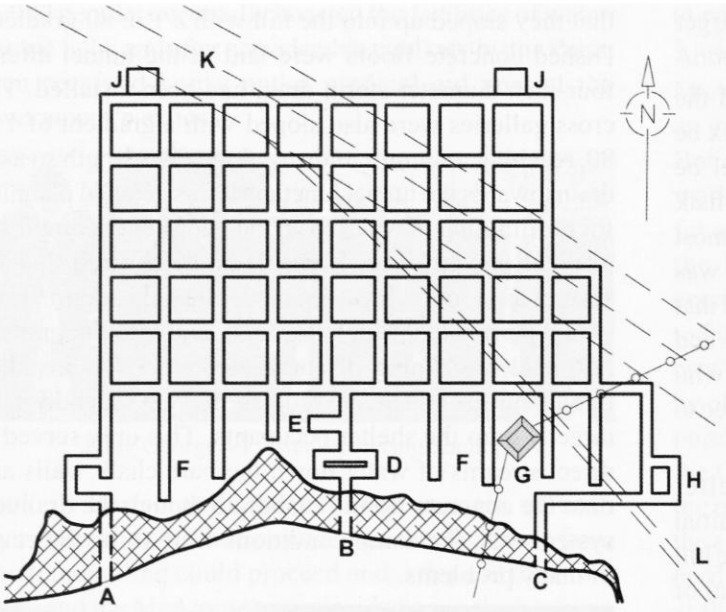
'Portsdown Tunnel Shelters', Regional Technical Officers progress report of 20 October 1941 (ref: HO 205-251).

As stated earlier, the primary tunnels were excavated so that they sloped up into the hill with a 1 in 80 gradient. Dished concrete floors were laid in the tunnel after a four-inch diameter storm drain had been installed. The cross galleries were also sloped with a gradient of 1 in 80, reaching a summit midway along their length so as to drain towards the tunnel junctions. This detailed planning for the draining of water from the two shelter complexes was not unwarranted. It was soon discovered that for several days following even moderate falls of rain, water would permeate through the chalk and into the tunnels. A tunnel roof lining of corrugated steel was installed throughout each shelter in order to prevent water dripping directly onto the shelter occupants. This only served to direct streams of water down the bare chalk walls and onto the concrete floors. Elaborate though the drainage system was, the damp conditions were to be the cause of many problems.



Wymering Shelter in January 1942

Above each shelter, driven vertically through the chalk to the surface of Portsdown Hill, were two ventilation shafts. The shafts were added to the plans when the capacity of the tunnel shelters was increased to accommodate five thousand people. All the shafts emerged on land belonging to the War Department and, because of this, the complicated structure that protected the head of each vent was constructed by military engineers. Built to Ministry of Home Security specifications, they were designed to prevent bombs or bomb blast from penetrating into the shelters. Beneath the hill, where each ventilation shaft entered the rear of the shelter complex, two overlapping baffle walls were



KEY:
A - WESTERN ESCAPE ROUTE,
(PROTECTED BY A CHICANE BLAST TRAP)
B - MAIN ENTRANCE,
(THIS EXTENDED APX. 15' FROM THE CLIFF FACE IN THE FORM OF A CONCRETE LINED SANDBAGGED PROTECTED TUNNEL)
C - EASTERN ESCAPE ROUTE,
(PROTECTED BY A CHICANE BLAST TRAP)
D - BLAST WALL BUILT OF BRICK
E - SHELTER WARDENS OFFICE
F - TOILETS,
(A 6" DIA. VENTILATION PIPE WENT UP TO THE SURFACE FROM ALL TOILETS, NO TRACE REMAINS)
G - EXISTING ELECTRICITY PYLON
H - EMERGENCY GENERATOR ROOM
J - VENTILATION / RESCUE SHAFTS,
(NO TRACE REMAINS EXCEPT THE ODD BRICK)
K - B2177 SOUTHWICK HILL ROAD
L - FOOTPATH NOW BLOCKED BY UNDERGROWTH

Drawn by Tim Robinson

WYMERING SHELTER

provided to further reduce any blast that had penetrated this far. The central entrance tunnel and two emergency exits at each shelter site were also similarly configured with baffle walls and reverses to reduce the destructive effects of any bomb exploding nearby.

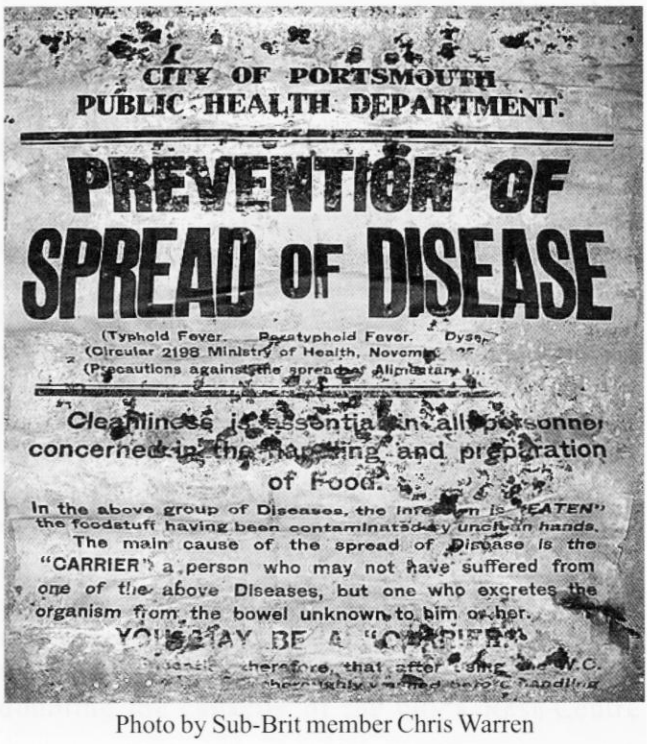
Including the extensions, the primary tunnels excavated into the face of the chalk numbered seven at each excavation site. Except for the entry and exit tunnels all the other tunnel mouths were completely sealed. The entrance tunnel at each site was lined with concrete that extended from outside, back to a widened chamber which housed a baffle wall. Beyond the baffle wall the tunnel continued only until it joined the first cross-gallery, another expedient to reduce the effects of blast.

While the fabric of the two shelter complexes was being completed, members of Portsmouth City Council were establishing the organisation that would ensure the effective operation of this unique undertaking.

The Committee, headed by Alderman L N Blake, was appointed on 9 May 1939 to co-ordinate the City's Civil Defence measures and the records of its work detail the main planning decisions for the Portsdown tunnel shelters. The Committee was guided in its planning by the requirements of the two government departments directly responsible for shelters: the Ministries of Health and of Home Security. The Exchequer was, after all, funding this work and expected to get value for money. Government guidance took the form of directives and circulars detailing all aspects of shelter policy, from the type of lighting and heating to the content of lime in cement. The implementation of these policies, nearly all of which had been founded on bitter experience, was overseen by the Regional Technical Officer and the Regional Commissioner .

ELIGIBILITY

All through the summer and autumn of 1941 the War Emergency Committee worked to turn the Government guidelines into working practice. From the beginning it was agreed that entry into the shelters would be controlled by the issue of tickets to priority cases. The inevitable points system was established that took account of age, parenthood and the availability of alternative shelter accommodation. The system was to operate regardless of income and position and an early suggestion that some form of entry charge be made was quickly rejected. Alderman Blake advised the press: "Other factors to be taken into consideration were absence of shelter at home, absence of husband in Service or on Civil Defence duties, illness, nervous debility and old age."


CITY OF PORTSMOUTH
PUBLIC HEALTH DEPARTMENT.

PREVENTION OF SPREAD OF DISEASE

(Typhoid Fever. Paratyphoid Fever. Dysen
(Circular 2198 Ministry of Health, Novem
(Precautions against the spread of Alimentary

Cleanliness is essential in all persons concerned in the handling and preparation of Food.

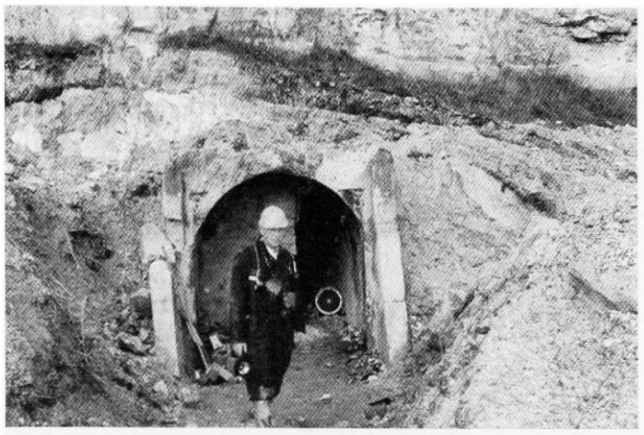
In the above group of Diseases, the infection is "EATEN" the foodstuff having been contaminated by unclean hands.

The main cause of the spread of Disease is the "CARRIER" a person who may not have suffered from one of the above Diseases, but one who excretes the organism from the bowel unknown to him or her.

YOU MAY BE A "CARRIER."

therefore, that after using the W.C. thoroughly [illegible] before handling

Photo by Sub-Brit member Chris Warren



Main entrance to Wymering Shelter in 1993

Optimistically, he estimated that the first shelter would be open by the end of November 1941.

At the end of August the Town Clerk took an action to prepare for the flood of applications for space in the new shelters. A Public Notice was issued on 25 September which formally requested applications from those who wished to reserve a place in the new 'Deep Tunnel Shelters, Portsdown Hill'. The notices were widely distributed throughout the city, were displayed in the numerous air-raid wardens' posts and were passed to schoolchildren so that they could take them home to their families. There was little response to this advertisement, however, and Alderman Blake, becoming concerned that the publicity had prompted very little response, urged that the campaign be stepped up.

Public reticence in applying was probably not helped by the strict procedure for obtaining a reserved ticket and the stern warning: 'Applications will be investigated'. But there was a stronger factor than this that kept people away: the bombs were no longer dropping on Portsmouth. It had been five months since the last major attack on the city and, since then, even daylight raids had been significantly reduced by the Luftwaffe. In the breathing space that this lull provided people's awareness of the shelter problem had diminished and had been rapidly replaced by more immediate problems. Despite this the authorities pressed on with the organisation: the shelters had to be ready for winter if the experiences of the last were to be avoided.

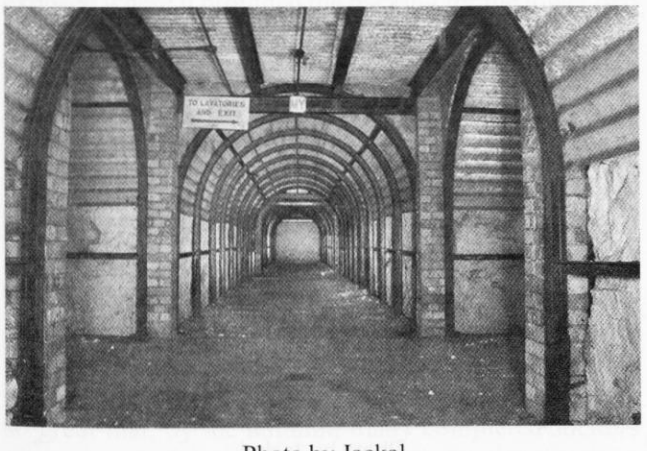


Photo by Jackal

Thus a second Public Notice, issued by the Town Clerk on 8 October, requested applications for the new posts of Shelter Superintendent and Shelter Wardens for the Civil Defence Wardens Service, Tunnel Shelters — Portsdown Hill. The Shelter Superintendent was to be responsible for all the city's air-raid shelters. Four men and two women wardens were to be appointed specifically for the new tunnel shelters, and were to receive three pounds ten shillings and two pounds seven shillings per week each respectively. For these unequal sums they all had to undertake to work a minimum of seventy-two hours per week. The job of Shelter Superintendent was taken by Mr R H Stammers who was given an office in Hampshire Terrace, Southsea, and received a salary of £6 per week. It was from this office that the tunnel shelter reserved tickets were controlled and issued.

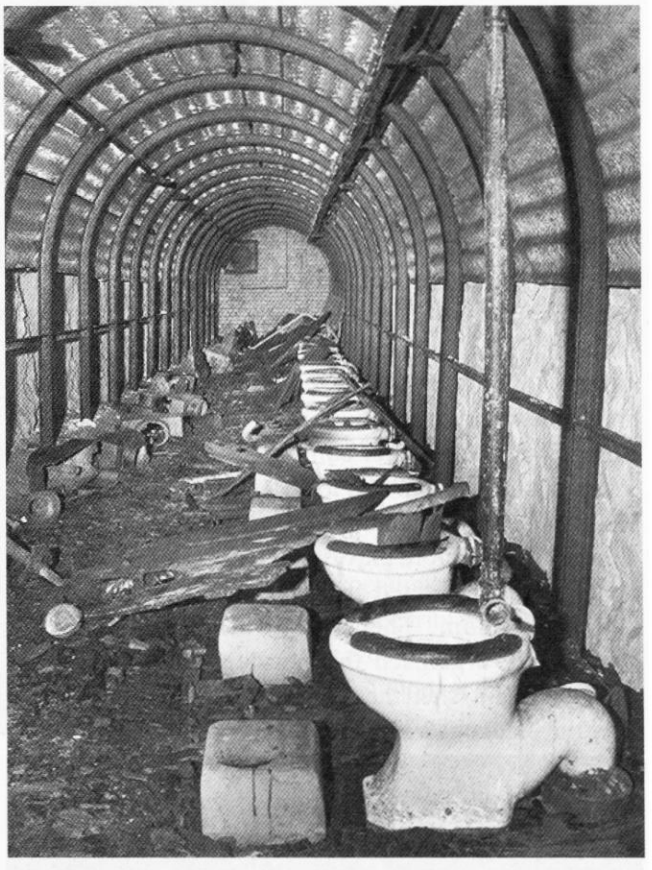


Photo by Ted Burgess

To look after the health of the five thousand people who were going to live in these two underground communities it was proposed to use the services of two local general practitioners. Already overworked, however, the two doctors who were selected could not be tempted away by a fee of one guinea a night. The War Emergency Committee records note that the medical profession considered this sum too low and thus, to provide at least one person for the post, an advertisement was placed for a temporary Assistant Medical Officer of Health at a salary of five hundred pounds per annum plus one hundred pounds residence allowance.

The Council's proposal to provide each bunk with a mattress was questioned by the Medical Officer of Health. Wisely he pointed out that, in the damp tunnel conditions, each mattress would require daily airing, no small task with over five thousand mattresses involved. It was then suggested that shelterers bring their own bedding, but this solution was thought to contravene the ruling that no personal effects be carried into public air-raid shelters. The argument continued for several months and was not finally resolved until December, shortly before the tunnel shelters were to be opened, when it was agreed to allow personal items of bedding into the shelters.

As the country embarked on its third year of war with Nazi Germany, the beleaguered citizens of at least one provincial city could face the future knowing that, if their home was destroyed, there was a place of refuge close at hand. Many did eventually make use of this bomb-proof haven, living a strange existence far from the light of day.

A TROGLODYTE COMMUNITY

On 4 December 1941, with the two shelters almost complete, Her Majesty the Queen inspected the Cliffdale site and was introduced to many of those who had played a part in the planning and construction work. Fifteen days later, members of Portsmouth City Council visited the Wymering complex and, finally, this shelter was opened to the public on 2 January 1942. The Cliffdale Tunnel Shelter became operational the following month. The capacity of each tunnel complex was limited to 2500 persons, all of whom had to be reserved ticket holders. The tunnels, which were opened to the public usually by 6pm, one hour before the official blackout, were reached by buses that collected shelterers from the terminus in nearby Cosham. The city's Passenger Transport Department organised this service which was made available again when the shelters were emptied, one hour after the blackout was lifted, usually by 8am.

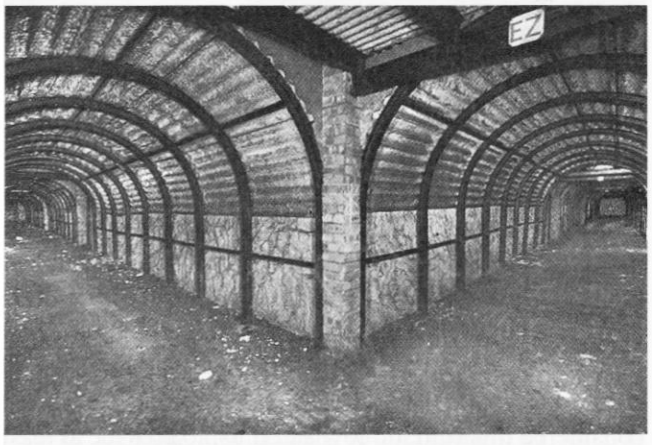
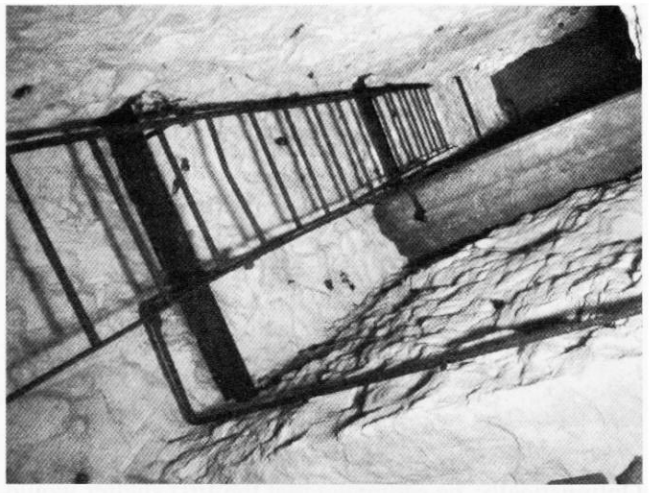


Photo by Sub-Brit member Chris Warren

At Wymering, access to the tunnel entrance was gained via a purpose-built pathway, that still exists, between numbers 32 and 34 Harleston Road. Passing behind the houses in Harleston Road the pathway led to the base of the old Wymering quarry and the impressive nine-foot-high concrete reinforced entrance tunnel. On either side of the main entrance were the only other access points to the shelter, and at both sites these were designated as emergency exits. Passing into the entrance tunnel and moving around the heavy baffle wall just inside, the new arrivals would have to become accustomed to the glare of the bare electric bulbs hanging from the arched roof.



Emergency escape and ventilation shaft. Photo by Ted Burgess

The power for this lighting was taken from the mains supply (230 volts), but there was also an additional one hundred volt auxiliary circuit that, when required, received power from a generator that was located in the east emergency exit tunnel at each site. The electrical system was controlled from the shelter warden's office which was the next point to be passed as those taking shelter moved deeper into the hill. Here wardens would check reserved tickets and allocate spaces inside the shelter. Most children were given fibre identity discs to ensure that they could always be directed back to their families if they strayed too far inside the tunnels. Despite early proposals to use coloured lights to guide shelterers and wardens through the network of galleries, a simple letter/number grid location system was finally adopted for this purpose.

After passing the baffle wall at the entrance, the concrete tunnel lining was replaced by a simple corrugated-iron roof supported at three-foot intervals by steel arches.

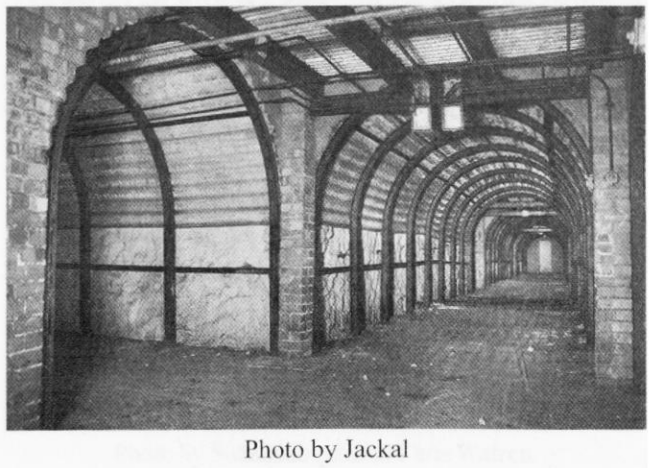
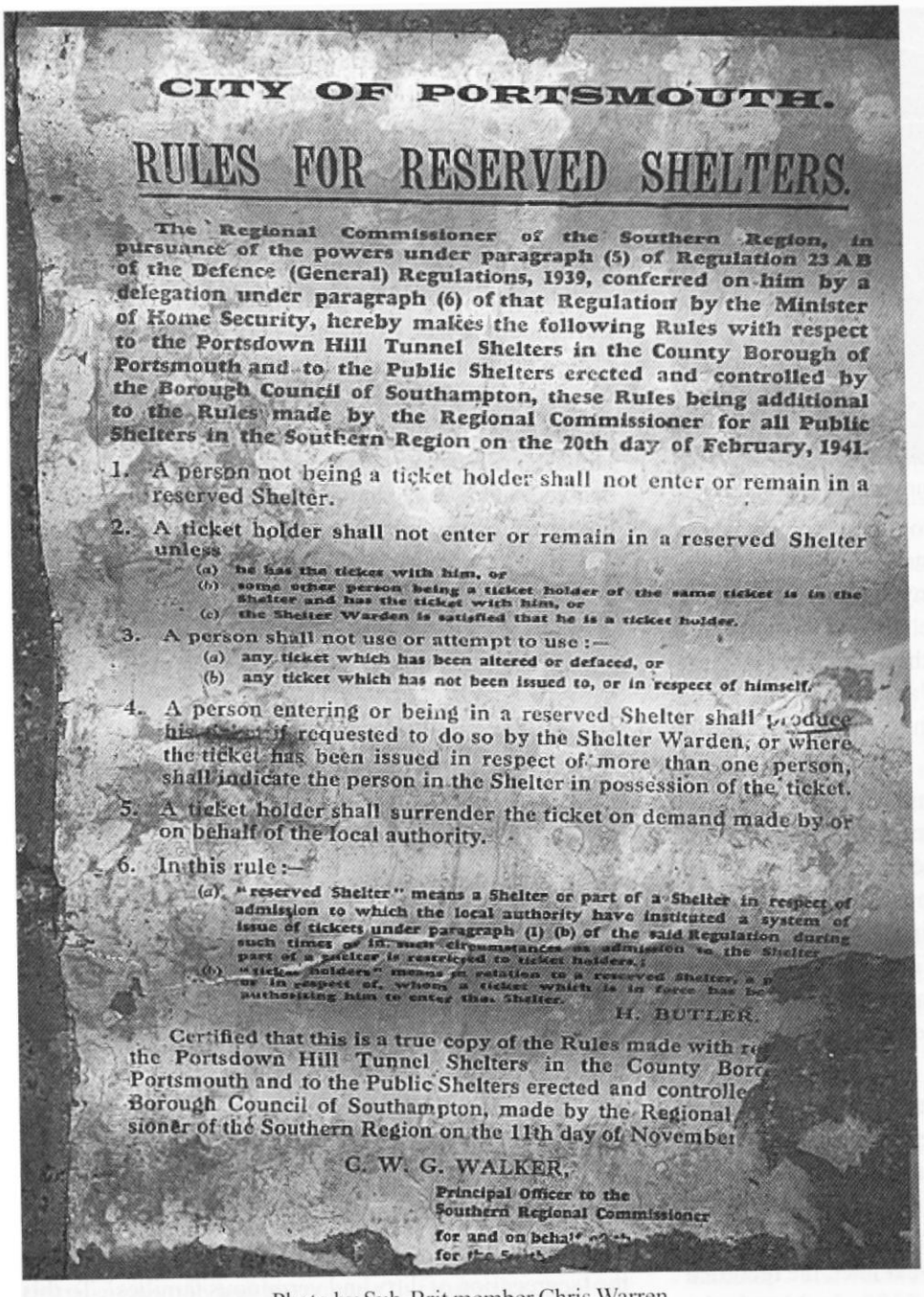


Photo by Jackal



CITY OF PORTSMOUTH.

RULES FOR RESERVED SHELTERS.

The Regional Commissioner of the Southern Region, in pursuance of the powers under paragraph (5) of Regulation 23 A B of the Defence (General) Regulations, 1939, conferred on him by a delegation under paragraph (6) of that Regulation by the Minister of Home Security, hereby makes the following Rules with respect to the Portsdown Hill Tunnel Shelters in the County Borough of Portsmouth and to the Public Shelters erected and controlled by the Borough Council of Southampton, these Rules being additional to the Rules made by the Regional Commissioner for all Public Shelters in the Southern Region on the 20th day of February, 1941.

1. A person not being a ticket holder shall not enter or remain in a reserved Shelter.

2. A ticket holder shall not enter or remain in a reserved Shelter unless

(a) he has the ticket with him, or
(b) some other person being a ticket holder of the same ticket is in the Shelter and has the ticket with him, or
(c) the Shelter Warden is satisfied that he is a ticket holder.

3. A person shall not use or attempt to use :—
(a) any ticket which has been altered or defaced, or
(b) any ticket which has not been issued to, or in respect of himself.

4. A person entering or being in a reserved Shelter shall produce his ticket if requested to do so by the Shelter Warden, or where the ticket has been issued in respect of more than one person, shall indicate the person in the Shelter in possession of the ticket.

5. A ticket holder shall surrender the ticket on demand made by or on behalf of the local authority.

6. In this rule :—
(a) "reserved Shelter" means a Shelter or part of a Shelter in respect of admission to which the local authority have instituted a system of issue of tickets under paragraph (1) (b) of the said Regulation during such times or in such circumstances as admission to the Shelter part of a Shelter is restricted to ticket holders ;
(b) "ticket holders" means in relation to a reserved Shelter, a p or in respect of, whom a ticket which is in force has be authorizing him to enter that Shelter.

H. BUTLER.

Certified that this is a true copy of the Rules made with re the Portsdown Hill Tunnel Shelters in the County Borc Portsmouth and to the Public Shelters erected and controlle Borough Council of Southampton, made by the Regional sioner of the Southern Region on the 11th day of November

G. W. G. WALKER,
Principal Officer to the
Southern Regional Commissioner
for and on behal
for the

Photo by Sub-Brit member Chris Warren

Where the tunnels intersected, the roof in that area was supported by four brick piers. The partial lining of the roof left approximately four feet of the chalk tunnel wall exposed where it provided the backing for the lower two positions on each three-tier bunk. It was not surprising, therefore, that the upper bunk position was considered the most comfortable: away from the damp chalk and unhindered by the comings and goings of the occupants of the two lower beds.

The bunks themselves were of a standard government pattern and were used in large public shelters all over the country, including the London Underground. The frame design allowed the centre bunk position to be folded up to allow the lower tier to be used as a seat. In mid-1941 the national demand for bunks of this type had been so great that, by the autumn, many completed shelters were left empty and unusable. It was this shortage that did more to delay the completion of the Portsdown shelters than any other problem.

Early in 1942 the first people to make use of the tunnels were mainly 'unauthorised' shelterers who had not troubled to obtain tickets. So much space was available to these few, however, that they could not be turned away. At Wymering, residents of the nearby estate used the tunnels only for the duration of air-raid alerts, returning home when the 'all-clear' was heard. The experience of the Portsmouth blitz, that drove so many citizens to take refuge in the surrounding countryside almost one year earlier, was fading. The intermittent use of the tunnel shelters prompted the Shelter Superintendent to ask for seating-only tickets to be issued as a bunk bed seemed inappropriate for these short-stay visitors.

In London, meanwhile, the government was becoming concerned about the cost of the national shelter effort. The overspending by the Ministry of Home Security on tunnel shelter schemes had resulted in an investigation by the Exchequer. Labour for civil defence work was being drastically reduced, and although major tunnel schemes still in progress in London, Birkenhead, Newcastle and Plymouth were to be completed, the Ministry of Home Security announced that it was most unlikely that any further deep, bomb-proof shelters would be approved. Now finished, it seemed that the Portsdown tunnel shelters were to become an embarrassing 'white elephant.'

The air raids on Portsmouth were not yet over, however, and although the scale of attack experienced in the early months of 1941 was not repeated, the tunnel shelters were soon to be filled to capacity. In April 1942 renewed attacks on the city revealed the full potential of the tunnels. On the sixteenth and seventeenth of that month the Shelter Superintendent noted that more and more authorised ticket holders were using the refuge beneath the chalk. By May, a regular clientele of Portsmouth

Photo by Ted Burgess

people were using the shelter accommodation on a daily basis. The majority of men and women shelterers were over fifty years of age and many were over seventy. Very few young men used the shelters and those that did were usually accompanied by their families. A large number of people had gained places in the shelter on medical grounds, something which required the applicant to furnish a medical certificate.

The continuing threat of raids ensured that the tunnels were filled to capacity night after night. Many of the regular occupants were those who had lost their homes to the bombs and, after a working day in Portsmouth, returned to the tunnels each evening to gather with their families. From this daily ritual of occupation developed the routine of all close-knit communities and it soon became clear that there was a need for more extensive tunnel facilities.

The minimum provision for a canteen service, planned in August 1941, was extended as the tunnels became fully operational. In 1942 the canteen area occupied just over one hundred feet of tunnel at each site and could supply hot drinks, sandwiches and hot meals. This necessary facility became so popular that, a year later, the recorded annual profit was in excess of £300. In March the Regional Authorities approved the appointment of eight full-time and eighteen part-time Shelter Wardens to operate in addition to the existing staff at both the Wymering and Cliffdale shelters, evidence of the increasing popularity of each refuge.

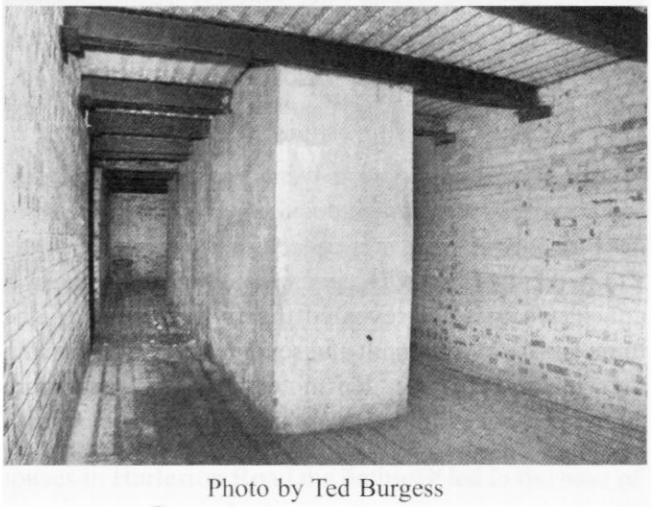


Photo by Ted Burgess

In June, following a number of instances of bedding being stolen, provision was made for a lock-up storage that could be rented for one shilling a week. A number of mains water standpipes were also fitted throughout each shelter and were available for all to use. Water was supplied from a 1200-gallon tank, provided by the Portsmouth Water Company, that was located outside each tunnel site. Lavatories were provided for men and women at each shelter and these were located at the southern end of six of the primary tunnels. Outside the tunnel entrances two huts provided ablution facilities that enabled shelter occupants to wash in the morning before going off to face the work of the day.

Certainly the health requirements of the shelter occupants were well taken care of, with a medical aid post provided in the easterly tunnels at both Wymering and Cliffdale. Unlike in the rest of the complex, the roof lining for these facilities was extended down to the concrete floor with bricks and mortar. Wymering's medical aid post was slightly the larger of the two and its inventory makes impressive reading:

NORTHERN TUNNEL AREA

Sick Bay	17 Beds
Nurses' Quarters	3 Beds
First Aid treatment room	4 Beds
Waiting room	6 Persons

SOUTHERN TUNNEL AREA

Waiting room	6 Persons
Consulting room	2 Beds
Doctors room	1 Bed
Infected disease ward	23 Beds

The twenty-three bed isolation area was provided for the 'segregation of dirty and verminous families'. To this end a mobile disinfection unit was also provided outside the tunnel shelters and, reported the War Emergency Committee on 5 October 1942, "was doing good work." Provisions were also made to allocate 300 bunks from each shelter for use as an emergency hospital. The beds that these would provide would come into operation in the event of further heavy air raids or an invasion but, fortunately, these plans were never put to the test.

The temporary Assistant Medical Officer of Health was aided in his work at the tunnel shelters by two duty nurses. Those who used the shelters were advised not to treat the medical facilities as if they were a free out-patients department; nevertheless, the nurses were kept busy with a constant flow of minor problems.

The closing days of 1942 saw a most unfortunate accident that badly injured a boy who, while playing on Portsdown

Hill, fell down one of the Cliffdale ventilation shafts. The subsequent investigation revealed that the protective cowl, part of the shaft head structure, had been damaged by vandals. After this, the cowls were made the subject of a regular inspection. On 16 January 1943 the *Portsmouth Evening News* reported that a women had been found unconscious in her bunk bed, at Cliffdale, when the shelter was being emptied the previous morning. A subsequent report by the Shelter Superintendent was inconclusive, however, and no further action was taken.

Not all the problems were of a medical nature. A roughly written, anonymous letter to the Lord Mayor, dated 10 May 1943, implored that action be taken against two wardens who, it alleged, repeatedly maltreated shelterers at the Wymering site. The outcome of this request, which was brought to the attention of the War Emergency Committee, is not recorded.

Photo by Sub-Brit member Chris Warren

EDUCATION AND RECREATION FACILITIES

An interesting development at the Portsdown tunnel shelters was the provision of a wartime nursery school at Cliffdale. In October 1941 Alderman Blake reported that a suggestion had been made to establish schools at each of the tunnel sites, in order to provide daytime care for young children while their parents were away at work. The suggestion had originated in July, with a Home Intelligence report that noted that the lack of such facilities was deterring women from taking employment. The idea was agreed in principle, with the intention of using the two huts at Cliffdale originally supplied to house McAlpine's men.

The Ministries of Health and Labour gave the idea their support but insisted that the proposal to accommodate 500 under-fives be greatly reduced. Eventually only one of the two huts was opened as a nursery school, by the Lady Mayoress, on 7 October 1942. The remaining hut was pressed into service as a pram shelter, thus overcoming the problem of pushchairs and the like being taken into the tunnels. The school, which was run by the city's Education and Health Committee, continued on this site until long after the war was over, eventually becoming the Cliffdale and Portsdown Day Nursery.

In addition to the facilities provided for this troglodyte community, various educational and recreational events were organised to brighten the bleak daily routine. One person who knew both shelters well was Alf Nicholson. He remembered the atmosphere of friendly comradeship that he experienced in the tunnel shelters.

An accordion player, Nicholson recalled the singing and dancing that often took place in the recreation area, a long gallery adjoining the entrance to each shelter. By 8.30pm, most children were in their bunks and, on raid-free nights, some adults would often leave the tunnels to visit a local public house. To ensure they still had a place in the shelters on their return, however, those who went out would obtain a late pass from one of the wardens. On 19 December 1942, the Shelter Superintendent organised a Christmas party for 700 children that took place in the tunnels.

In July 1942 the Bishop of Portsmouth proposed that religious services and lectures be held inside the tunnels on a regular basis, and the first such service was conducted on 17 August that year. These simple diversions must have been of little comfort to those that spent their lives, with their families, living in this elaborate hole in the ground.

The long working hours, the many night-time Civil Defence duties, the irregular meals and the total lack of privacy in this environment must have been wearing on even the strongest of characters. Yet, for those without homes, it was better than spending sleepless, uncomfortable and unhealthy nights in small air-raid shelters, village halls, barns and open fields. But, of all the many problems arising from living and working out of this underground community, the constant damp and wet inside the tunnels must have been the greatest hardship. The records detail a list of complicated and expensive measures to overcome this problem.

Photo by Ted Burgess

PROBLEMS TO OVERCOME

The Research and Experimental Department of the Ministry of Home Security conducted experiments, in 1941, to determine what heating and ventilation would be necessary to maintain adequate temperatures in "underground chambers". By December of that year, Professors Hay and Strathon reported their findings and recommended that heated air would be required in the winter months, but not in the summer. They also advised that no means of extracting humid air would be needed.

At about this time, back in Portsmouth, the City Engineer had come to the same conclusions about winter tunnel conditions as had the professors. He reported to the War Emergency Committee that the tunnels were "cold and damp" and proposed that a heating plant, to maintain a temperature of 50 degrees Centigrade, be installed at a cost of £5,000. Alternatively, he suggested, drying rooms could be provided for the bedding at a cost of £10,000. The problems of cold and damp, that first came to light that December, were never really resolved throughout the life of the Portsdown shelters.

Shocked by the estimated costs of the proposed solutions, the Committee called together the City Engineer and the Medical Officer of Health to review the requirements of a heating system for the tunnels. This resulted in a new proposal for a low-pressure hot water heating system, for each tunnel, that would cost £1,000 per annum, per shelter, to operate. The details were passed to the Regional Authorities for comment but, for over a year, nothing more was heard on the subject.

The City's Assistant Chief Engineer, Donald Exley, recalled the appalling problems of damp and wet. Following even light rain showers, water would permeate through the chalk and find its way into the shelters, often emerging in parts of the tunnel as a fast-flowing stream. In most instances the torrent quickly subsided to a mere trickle of water, but this would often continue to flow for many days. Exley was frequently called to the tunnels to inspect the evidence of seepage but, he admitted, there was little anyone could do to overcome the problem. Even in the summer months the situation did not improve and although the ingress of water virtually ceased there was another source of damp created by a different phenomenon.

Contrary to the predictions of the two professors, the warm, moisture-laden air in the tunnels condensed on the cool metal and chalk surfaces and soaked shelterers' clothes and bedding. The situation became so bad that the Shelter Superintendent approached the War Emergency Committee again in the hope that they could get something done about the problem. They could only report, however, that the question of heating and ventilation was still under consideration.

The winter of 1942 passed with the same appalling conditions still continuing in the tunnel shelters. It was not until 12 April 1943 that the Regional Authorities gave their authorisation, not for the costly heating system, but only for the installation of a ventilation plant. The War Emergency Committee minutes record that the contractor for this work was Messrs Haden & Sons, of Bournemouth, who would be paid £695 for each tunnel. The final cost of the ventilation system was in fact almost four times this figure so it is more probable that the work was based on each tunnel ventilation shaft. Exhaust fans were provided in each medical aid post and all the lavatories, while the ventilation shaft chambers, at the rear of the tunnel shelters, were each adapted to house an electric induction fan. Following these additions there is little further record of complaints about the damp.

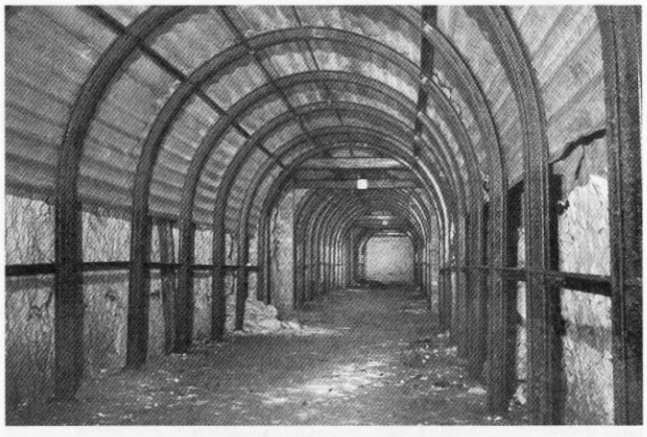


Photo by Jackal

To combat the cold of the following winter twelve Valor oil stoves were purchased for use in the welfare sections of each tunnel, but these probably offered little comfort to the growing number of shelter users. It was the City Engineer who had the last comment on the subject, reporting on 31 January 1944 that the metal bunks were now so rusty as to require cleaning and two coats of paint. This exercise, he estimated, would cost £200.

On 16 April 1943 McAlpine concluded their contract and received their last outstanding payment of £1,500. Herbert Morrison, Home Secretary and Minister for Home Security, wrote to the Portsmouth City Engineers Office congratulating them for their expeditious and cost-effective work in completing the tunnel shelter project. Morrison, who had toured the Cliffdale shelter complex three months previously, had always been keen to control the cost and energy applied to Civil Defence projects. Shortly after coming to office, when questioned in the House of Commons why he had not authorized a deep-shelter plan for Stepney, he replied:

"I am concerned to get the maximum protection possible within the limitations of the materials available, and I really cannot pursue a policy which means concentrating materials in particular districts at the expense of all other districts."

His praise for Portsmouth's tunnel-shelter scheme was well founded. The wartime cost of tunnelling in chalk varied from £14 to £21 per person accommodated, according to a Government survey conducted in 1946. Tunnel shelters excavated at four sites in south London to sleep 5200 people cost the Government £100,250. In the capital eight huge shelters, known as the New London Tube shelters, were built to accommodate a total of 64,000 persons. These were completed in 1943 and cost a staggering two and a quarter million pounds, a little over £35 for each shelterer. Since most of the provincial deep shelters were converted from existing tunnels, caves and quarries, the unique purpose-built Portsdown shelters were a bargain at £73,298. The recorded breakdown of this cost is remarkably simple.

£68,621	Paid to contractors (including McAlpine)
£1,963	Portsmouth City labour costs.
£2,714	Ventilation system.

Raid alerts in June 1943 caused people from the Wymering area to congregate outside the tunnel shelter there, in case an attack ensued. But, by the middle of August, bombs were again forcing people to make use of the Portsdown tunnel shelters and all the reserved-place tickets were being issued at this time. The Shelter Superintendent was even allowing non-ticket holders, who queued outside the tunnel entrances, to use bunks that had not been claimed after 10pm. The threat of air raids continued into 1944 and was then compounded by the new threat offered by the V-weapons. In April of that year the Shelter Superintendent reported that he was worried about overcrowding, and suggested that a limit of four thousand persons per shelter be adopted. Those not lucky enough to claim bunk beds used what space they could find throughout the maze of tunnels to obtain a night's rest.

The Portsdown tunnel shelters continued to be updated and improved, in line with Ministry guidelines and safety requirements, until the end of the war. In May 1944 new diesel generating sets were installed at each site, capable of supplying enough auxiliary power to run both the lights and the electric ventilation fans. Crowd control barriers and speakers were erected at the tunnel entrances and the disinfecting facilities were extended.

The end was in sight, however, and, following the invasion of France, Portsmouth gradually began to relax from its stance as a front-line city. The beaches were cleared of obstacles and barbed-wire entanglements and there was a general relaxing of the now intricate system of air-raid precautions.

By September, only a few people were using the tunnel shelters and, after due notice, all unclaimed bedding at both sites was burnt. The canteen facilities were scaled down and were finally closed in January 1945. A survey on the 8th of that month revealed that seventy people were using the Cliffdale shelter every night while at Wymering the figure was only half this. Most of the occupants, claimed the survey, were homeless people making the most of the cheap accommodation. As a result, at 9pm on 19 February 1945, the Wymering shelter was closed and put into care and maintenance. The same fate befell the Cliffdale shelter a month later.

The Portsdown Tunnel Shelter complex was put into care and maintenance immediately following its closure in 1945. There was a brief time when it was considered as a storeage for government documents but this idea was quickly discounted when the tunnels were surveyed and found to be excessively damp. Later, a proposal to run a mushroom farm under the chalk was turned down by the Portsmouth Corporation who, finally, sanctioned its use as pistol and rifle range. By the late 1950s, both tunnels were derelict and the entrances bricked up - although children were known to find ways of entering the underground complex. In the early 1960's one youngster who gained access via a ventilation shaft fell and suffered severe injuries. This incident prompted all the vent shafts to be capped and the installation of more robust concreate seals over the former entrances. In the 1990s the Ciffdale shelter was opened for inspection and photographs. The tunnel was sealed completey afterwards. Thus masked, the Tunnel Shelters became virtually invisible - as they are today - and their role in wartime Portsmouth all but forgotten.

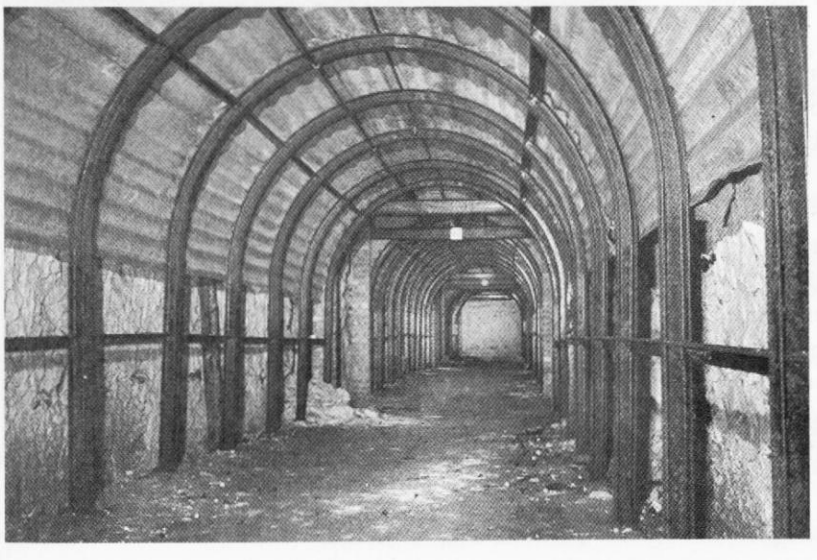
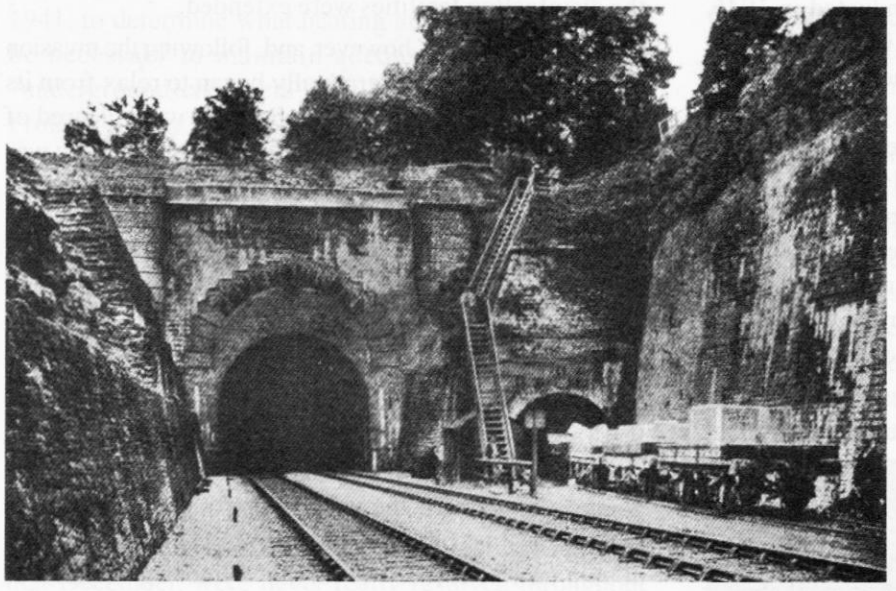


Photo by Jackal

An Obscure and Unique 'Industrial' Engine Shed

Roger Griffiths



The entrance to Tunnel Quarry before being commandeered for government use.

If travelling by train from London to Bristol via Chippenham you pass Corsham and enter the two miles of Brunel's Box Tunnel. Just before the tunnel portal, on the up side, another single-bore opening is still to be seen today; this was once the rail entrance to a huge World War II underground citadel.

The citadel was based upon a number of underground quarries, from which the famous Bath stone had been excavated for years. The quarries were progressively taken over by the Government in World War II and over a period of years, and the expenditure of (for that time) the huge sum of over £4 million, there were eventually no less than 125 acres of underground complexes. These were variously used for the storage of millions of tons of ammunition, Bristol aircraft engine production, BSA machine gun production for the likes of Spitfires and Hurricanes and a Royal Air Force Fighter Command control room. There was even a secure holding area for items like the Crown Jewels, Elgin Marbles and other priceless antiques.

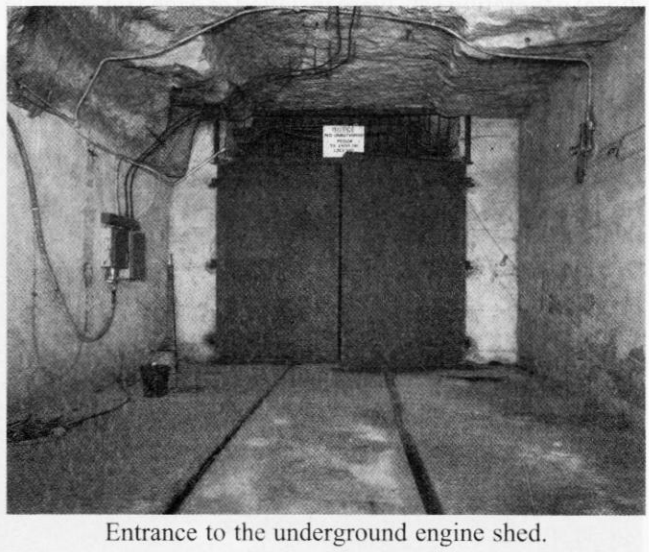
Tunnel Quarry was one of the largest and being adjacent to Box Tunnel it had a rail link provided early on. With an eye to a dangerous future, the War Office bought the quarry from Bath & Portland Stone in 1936 and immediately started conversion work. This involved removing two million tons of stone debris and reinforcing the 45-acre labyrinth so that it was bomb-proofed, complete with air-conditioning, its own power station, a massive MoD telephone exchange and a barracks, mainly for housing the WAAFs working in the Fighter Command control room. At any one time, some 300,000 tons of munitions were stored there and at its peak 4,000 people worked in the various underground halls.

After World War II came the Cold War and the complex was eventually converted further into a Government War Headquarters, to be fully self-contained and self-supporting for months in the event of the then much feared nuclear attack on Britain. After 1980 though, the underground quarries were gradually given up and today are mostly used by commercial organisations for such things as secure storage and accommodation for huge, back-up corporate and banking computer systems.

One of the last parts to be taken off the restricted list was the area around where the rail access was made and here, it has been revealed, was a small underground engine shed for the handful of Hudson-Hunslet diesel-mechanical shunters that worked within the complex. The old photograph shows a munitions train entering Tunnel Quarry in the 1940s, hauled by a just visible Hunslet. GWR and BR (W) locos proceeded no further than the notice board seen at left of the access line. Beyond that was a siding with pit, leading to a small turntable feeding three other roads - an underground roundhouse!

Quite what will happen to this unique engine shed is not yet clear, but its future cannot be very secure as there is now no need for rail traffic. In fact, the access siding from the up main line was removed years ago. Only time will tell...

Source: "Secret Underground Bristol" by Sally Watson (ISBN: 1-874092-95-8).



Entrance to the underground engine shed.
Photo by Nick Catford

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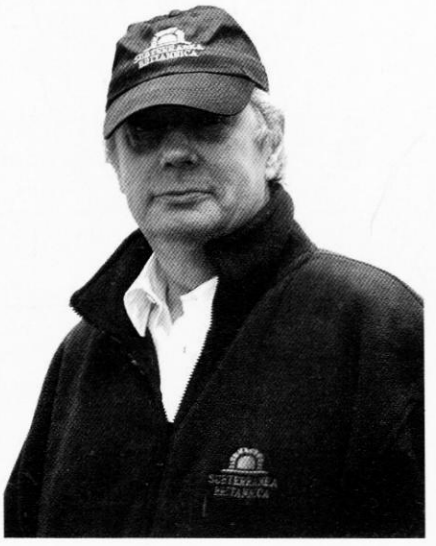

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